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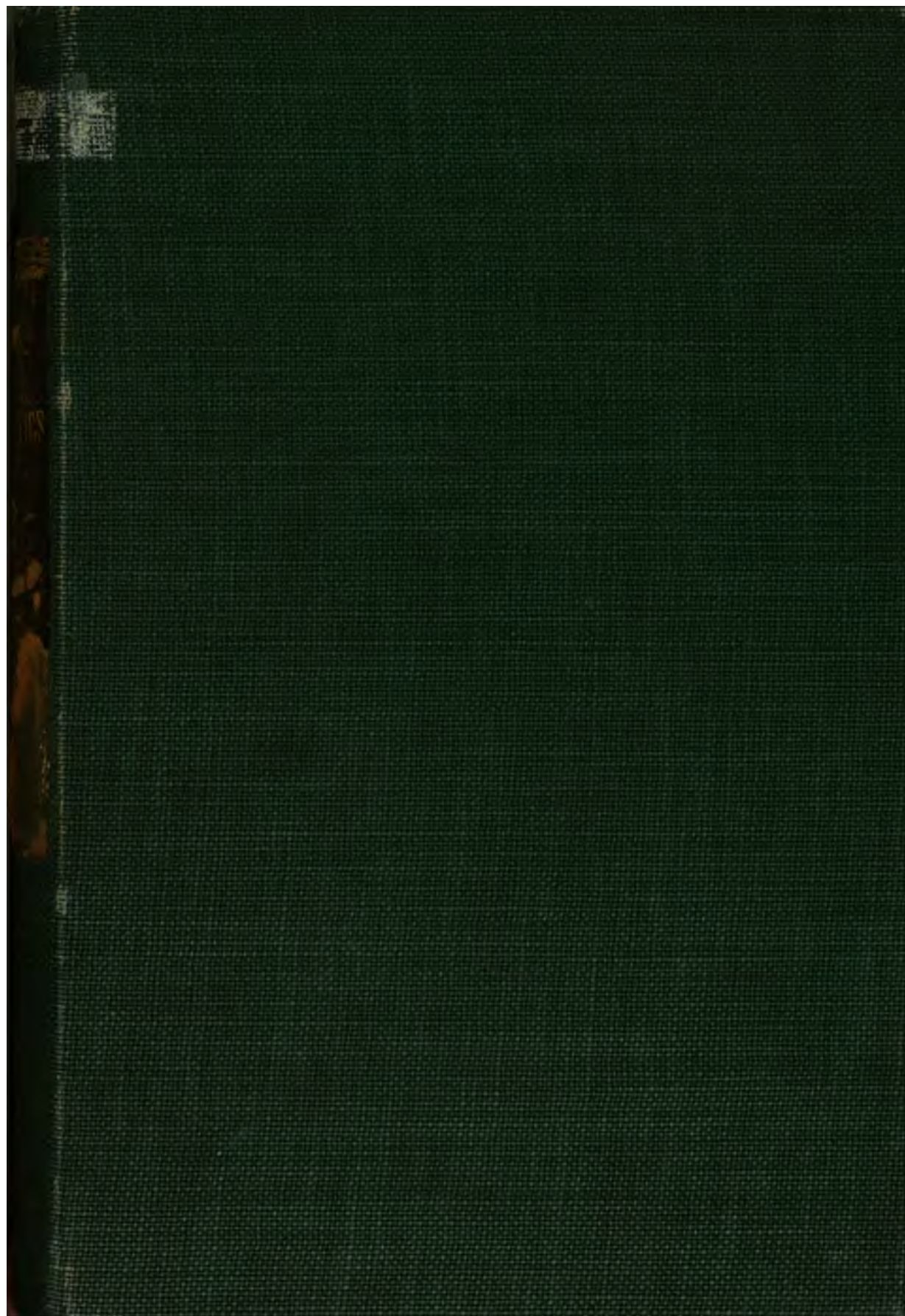
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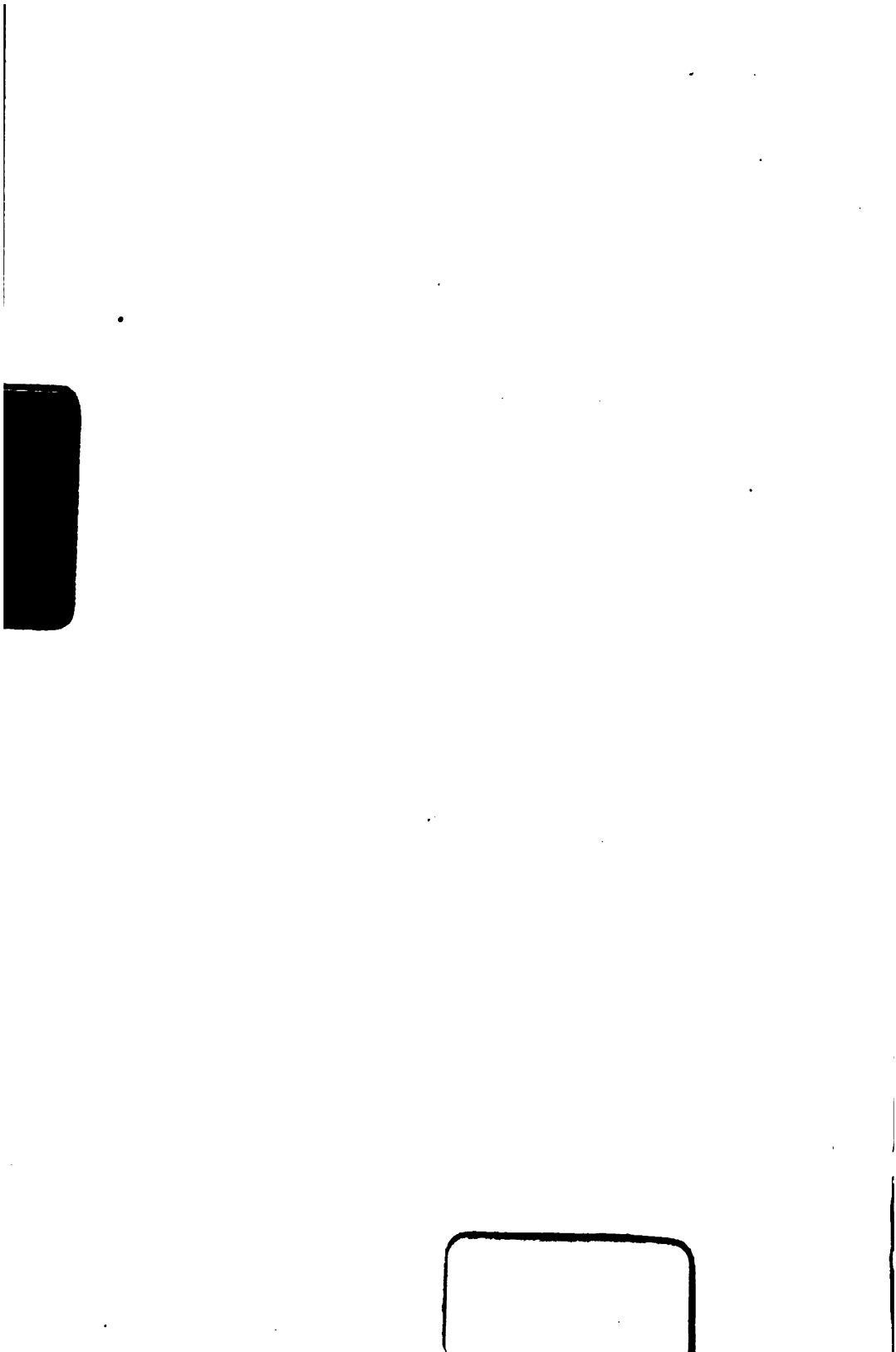
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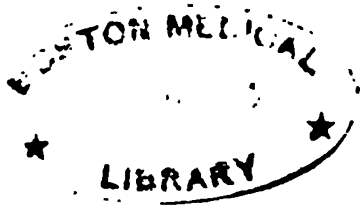
THE JOURNAL
OF
ELECTRO-THERAPEUTICS

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ORIGINAL ARTICLES.

CICATRIX AND STENOSIS OF THE CERVIX UTERI TREATED BY ELECTRICITY.

BY ALICE B. CONDUCT, M. D., ORANGE, N. J.

In this day of multitudinous surgical procedures there is no more frequent reason given for an operation than cicatrix of the cervix uteri. Often it may be that at the time of observation it is but slightly lacerated, the major part of the tear having healed spontaneously, leaving more or less cicatrix. The patient comes to the physician complaining of pain on top of her head, as from a weight. She fears she shall go insane. Is sleepless and depressed. On examination a slight laceration may be found, and on further digital exploration seams are felt in the cervix. Evidently the major part of the tear was healed immediately after the birth. The surgeon declares those cicatrices are the cause of her trouble, and demands that trachelorrhaphy shall be performed. He is probably correct in attributing the nervous symptoms to the cicatrix, but I question his decision that only surgery can help his patient.

We are, however, taught by our greatest leaders in surgery at the present moment that the only sure method of

correcting cicatrix is to remove it entirely. Hundreds of thousands of women are yearly being operated upon surgically to correct ills that this cicatrix is said to produce. But Philadelphia's greatest electrician, G. Betton Massey, says: "Healed scar tissue is as harmless in this position [in the cervix uteri] as elsewhere in the body. Scar tissue, moreover, is also left after the operation to remove it." He goes further and adds: "The gynecological dispensaries of our large cities have become shambles! where women by the score are persuaded to undergo operations that are unwarranted by sound judgment, and the nature of which is not explained to them!" I am confident we can testify that this sweeping charge is a true one.

In studying the literature of the day on the treatment of cicatrix of the urethra, of the rectum, of the esophagus, and of many other parts of the body, we find there have been brilliant cures wrought by the application of the negative galvanic current directly to the cicatrix. The dense, unyielding tissue has softened and become elastic, deformities are corrected, and delicate nerve filaments are set free, thus relieving reflex nervous symptoms for which, in most cases, the patient applied to the physician for relief. Why may we not take the hint thus given us and use the same agent for cicatrix of the cervix? I am well assured that few, if any, of these conservative physicians are among my hearers to-day.

Why, then, should I present the subject when I shall not be likely to reach those who most need to be convinced that, in many cases, they are performing trachelorrhaphy where the needs of the patient would be much better met by the electro-gynecologist? I am not now speaking of the freshly lacerated cervix or the sloughing cervix, but the healed cervix. I do so: First, because I wish to agitate the subject, that you may be stimulated to give me points on your methods. Second, because by reiteration and defense we establish our position.

That I may be enriched by your experiences and research I shall *venture* to give you an account of some cases I have met in my dispensary and office, hoping you will feel this is simply your text to enlarge upon in remarks later.

There is probably no portion of the human body that is more capable of decided and speedy changes in its structure than the uterus. In the fetus we find it situated in the abdomen, more cervix than body. In childhood we find it in the pelvis, beginning to assume characteristic shape and texture. At puberty more rapid changes occur. After menstruation and conception the uterus is more capable of changes in texture, size, and position than any other organ in the human body. It is faith in the marvelous recuperative power the uterus possesses, its rapid transition from one condition to another, that builds our hope on its power to yield to the magic influence of electricity.

Personal experience and record of cases treated will always be the most direct and attractive method of elucidating the truth we wish to convey. I will, therefore, at once give you a few cases illustrating the treatment of cicatrix of the uterine cervix.

CASE I. Mrs. A., forty-eight years of age, is a case of cicatrix, producing stenosis. She complains of insane feelings, fears she shall kill some member of her family, head so confused she dares not come to my office alone, so tired all the time, aching in pelvis extending down limbs. Has had five children, and all these births were difficult. Haggard, cachectic countenance, with very dark rings under her eyes.

Examination of uterine region reveals a peculiar pearly-white cervix, hard and firm; a pin-hole os; impossible to penetrate cervical canal with my smallest sound; uterus retroflexed and bound down. At first I strongly suspected a scirrhus condition, as I had never met so dense a condition in any other case of simple stenosis. A specimen of the

cervix under a good microscope, however, with the aid of a specialist did not confirm my suspicion. It was simply multiple cicatrix and profound stenosis. Therefore I decided to apply the negative galvanic pole by an aluminum electrode to the tiny dépression where the os should be, the positive pole by broad electrode to abdomen, and turned on 15 ma. for ten minutes. Gave treatment two times in a week for four weeks. In three weeks the patient said she felt much relieved, although an entrance to the cervical canal had not yet been made. In five weeks' time an entrance was at last gained, and my smallest silver sound was introduced. The insane feelings were gradually leaving her. The exhaustion decreased.

From this date the patient improved rapidly: By the end of two months' treatment the cervix was normal in texture, and had assumed a natural pink hue. All the surrounding tissues were more pliable. The distressing nervous symptoms were so far removed that I could not induce my patient to persist longer to enable me to loosen the adhesions and bands that bound the uterus down to its retroflexed position.

CASE II. Mrs. B., about thirty years of age. A tiny woman with a still more tiny pelvis, measuring less than three inches antero-postero. Has had three children. All were instrumental deliveries. The last two were taken at seventh month, as the physician in charge decided her pelvis was too narrow to deliver a full-grown fetus.

She complains of much distress in base of brain and in vertex. General exhaustion and pain in lumbar region. On examination I find a tiny uterus. Cervix almost obliterated. The os is small, cervical canal difficult to enter. Seams are stellate around the hardened and flattened, deformed cervix. The whole condition is easily accounted for in the history of the three difficult instrumental deliveries. Treated this case for two months and a half, using from 10 to 15 ma. galvanic negative electricity

in the cervix, the positive pole on abdomen from ten to fifteen minutes at a sitting. In using the negative pole I always find there are tiny bubbles of gas (hydrogen) coming from the cervix at intervals of from five to ten seconds.

The results in this case were a really great success, the little woman declaring herself well. The nervous symptoms have disappeared. I discharged her, to return to me for observation once in three months for one year, thus being able to watch the case and note changes, which I confidently expect will go on, as the negative pole is slow and continuous in its effects, the softening and beneficent influences seeming often to continue even after several months have elapsed since treatment. The flattened condition of the cervix is slowly being relieved, and at the end of six months from now I confidently expect to find she has a normal cervix once more, projecting into the vagina as it should.

These cases, illustrating the beneficent effects of negative galvanic electricity in ordinary cicatrix, lead me a step further to very briefly refer to a method I have used more or less for cases of laceration of the uterine cervix since my late residence in India.

The native women of India, as well as Eurasians, have a horror of the knife. To suggest surgical treatment to them is to so terrify and prejudice the patient that you never have her to treat again.

There is a good ground for their intolerance of surgery, as the intense heat and lack of trained nursing have given bad records in major and in minor surgical cases, tetanus or septicæmia often resulting from even minor surgery.

It was imperative to gain the confidence by removing the exhausting purulent discharges. In my dire need I recalled my experience in Chicago with such sloughing surfaces. There I had the good fortune to be directly under the guidance of Dr. Julia Holmes Smith, whose rare good judgment and quick insight had many hundreds of times

taught me I must not sacrifice my patient to a theory, but treat each individual case for its special needs. We had a large gynecological clinic, and on several occasions of what we then termed ulcerated cervix she had used fuming nitric acid and got good results. Quick granulations had ensued and patients were discharged in excellent spirits.

Dr. Julia Holmes Smith at that time did not use the nitric acid with any idea of healing lacerations, but simply to cleanse sloughing surfaces, and produce healthy granulations. I used it for these lacerated cases for the same reason, never dreaming I should get any other result than a healthy granulating surface. Several cases, however, returned to me after $1\frac{1}{2}$ and 2 years for confinement, having become pregnant. My amazement was great to find, after confinement was over, that my patient had a normal cervix. What had wrought the cure?

During my term of five years' residence in India I had from time to time opportunity to see these cases again that I had treated by the nitric acid and *pinus canadensis*. Every one reported entire freedom from the distressing purulent discharges. Those I had a chance to examine were healed. A few presented as perfect a cervix as if no laceration had ever occurred. There was one case that had stenosis. This made me wary. I found, however, that those who conceived and delivered a child soon were far better cases than those who did not become pregnant. I determined to work carefully and note results.

On my arrival home in America, now nearly five years ago, I studied electricity at the New York Post-Graduate Medical School, etc., and then learned for the first time the wonderful power of the negative galvanic pole.

I took fresh courage, determining to apply it to my cases to be cured by this non-operative method of repairing lacerated cervix. Seeing, as never before, the possibilities the use of the acid opened before me, I did not dread stenosis if the negative galvanic pole was wisely applied.

At my dispensary in Newark many cases came for cure of laceration, and I enthusiastically worked on, noting results.

When I had treated about thirty cases with no serious drawbacks to my knowledge, I had two cases that threatened to discourage me much. These two patients refused to have the negative galvanic electricity used sufficiently and stenosis resulted.

One of these cases was, however, addicted to criminal abortions. It was impossible to judge how much of the stenosis she suffered from might not have arisen from the rough treatment she gave the cervix in her frantic attempts to destroy a suspected fetus. Even in such an extremely mutilated case, however, I should have great hopes of getting a good canal without evil results from cicatrix had I been allowed to pursue the negative galvanic treatment sufficiently.

Subsequently the idea presented itself to me that dilute nitric acid would possibly answer the purpose of producing sufficient granulations to build up the laceration, and, in such ungovernable subjects as those just cited, would insure me against evil results, even if the case were cut short in the midst of treatment.

I have now used the dilute acid for two years, and am much better pleased with results than with the pure acid. I continue to use the negative galvanic pole during the process at several stages of the cure. The healing is done by building up tissue from below till a perfect cervix is the result.

There have been to date sixty-one cases treated. I have felt very cautious about reporting this method, till several years have elapsed to test the results in a variety of cases. As far as I am able to discover, the results are to be favorably compared with trachelorrhaphy. This could not be said were it not for the molding and tempering power of the negative galvanic pole.

In America surgery is by no means prescribed as in

India. But even here many a woman suffers for a lifetime rather than brave the dreaded operation, trivial as it may seem to the great surgeon.

In patients where there is a cystocele or a rectocele, or both, or where a perineum must be repaired, it is better judgment, no doubt, to perform trachelorrhaphy at the same sitting with the other plastic operations required. But in cases where the patient needs simply a lacerated cervix repaired and dreads surgery, or has heart disease, prohibiting an anæsthetic, or is a poor woman, not able to leave a family of small children, the method by dilute acid and negative galvanic electricity is both successful and grateful to the patient.

The cases I have to show of cervix thus healed are as perfect in shape and consistency as the cervix that never suffered from an accident. No seams, no fretted nerves, no detention from families or business. The woman comes to the office for applications, for she must do so in any event, as there are very few cases that admit of trachelorrhaphy without an initial course of treatment, varying from six weeks to three months, the preparatory treatment being needed to reduce endometritis, or catarrh, or perimetritis, displacements, and very probably ovarian trouble to be corrected.

All or any of these complications can receive attention while the cure of the laceration is going noiselessly on.

Is it not possible that there may be others present who have some experiences to present in a similar line?

With the negative galvanic pole as our resource, may we not surmount obstacles that a few years ago seemed impassable barriers?

Discussion.

DR. J. H. GUNNING: I consider the paper a very practical and reliable one, and I can substantiate in every particular the experiences therein detailed. I have found nitric acid very excellent in the stimulation of growths, but I have not employed it so exten-

sively as the author has done in cases of lacerated cervix. Where I have succeeded in thoroughly destroying the hardened tissues with nitric acid, I have found that they ordinarily granulated very satisfactorily. In one case, however, a complete bridge was formed along the lower portion of the cervix, so that the part appeared to be naturally repaired. Further examination, however, revealed quite a sinus beneath this bridge. It occurred to me at that time that this treatment would prove to be an excellent one for this class of cases. Now, at a time when the knife is being largely laid aside, particularly in gynecology, I am very happy to hear a paper of this kind. It is much more pleasant to read than the description of a case in which an *operation* has been successful, but the effect on the patient may have been more than questionable. I have found that even the application of the negative pole to a cervix the seat of cystic degeneration has materially improved the local condition, even without a resort to nitric acid. In conclusion, I cannot speak too strongly regarding the practical character of this paper.

DR. FLORA A. BREWSTER: I would like to ask what results are obtained by the author in cases of laceration with much cicatricial tissue and decided stenosis—in other words, in cases where it is impossible to introduce the finest sound owing to flexion at the neck.

DR. CONDUCT: Last winter I had a case of this kind which Dr. Gunning saw with me. He told me to insert a needle into the flexion and connect it with the negative pole, while the positive pole was placed on the back. I passed the needle through Douglas' *cul-de-sac* into the flexion, and continued the treatment at short intervals for a period of several months. I have heard recently, from friends of the patient, that she is feeling perfectly well, although I do not consider her as yet entirely cured. In her case there was a laceration up to the fornix of the vagina on both sides. The lips were covered with an abundant purulent discharge, so that at first sight I was inclined to believe that the cervix was the seat of cancerous degeneration.

DR. GREENLEAF of Owego: I should like to thank the author of this paper and Dr. Brewster for some interesting practical hints. Insane patients come to me who have been neglected for years because of their fear of surgical operations. I have found electricity to be very useful in the treatment of these cases. I wish here again to return public thanks for the hints I have derived from these two papers.

EXHIBITION OF AN ELECTRICAL ENDOSCOPE, LARYNGOSCOPE, AND STETHOSCOPE.

BY M. MILTON WEILL, M. D., NEW YORK.

I wish to show you several useful instruments, although they are in rather a crude state as yet. In this age of endoscopy the endoscope is behind the operator—in other words, the trouble has been to get the light at the point of operation. In previous endoscopes the light has been reflected, and as a consequence there has been a mass of shadows on the operator's head. In my first attempts I did as the others had done before me: I attempted to use only reflected light, and I came to grief. In the instrument I now show you a miniature incandescent lamp of $1\frac{1}{2}$ candle power has been inclosed in a casing, so that the light is only allowed to escape through one small aperture, and hence it does not dazzle the sight of the operator. When this endoscope is placed down on a printed sheet, it is very easy to read even fine print with it.

One is often at a loss for a convenient means of satisfactorily examining the throat unless one is bountifully supplied with special apparatus. I show you here a very simple and inexpensive instrument for the proper illumination and examination of the throat.

Let me show you still another instrument. You all know that good physical diagnosticians are about as hard to find as the traditional needle in the haystack. I have constructed a stethoscope for magnifying the normal and abnormal sounds of the heart and lungs. A diaphragm with a microphone attachment is placed in the primary circuit of an induction apparatus, and a telephone in the secondary circuit. This apparatus enables one to readily hear the slightest sounds in the chest. I must confess that there are certain adventitious sounds which are of necessity also magnified, so that it requires practice to successfully use this instrument.

THE CLINICAL USES OF ELECTRICITY IN MUSCULAR DEVELOPMENT.

BY WILLIAM HARVEY KING, M. D., NEW YORK.

In order to facilitate the description of the different classes in which there is a lack of muscular development to which this method of treatment is applicable, I will divide the subject into four parts: First, those due to some central lesion, as in the brain or spine; second, those due to peripheral causes; third, functional disturbances; and, fourth, congenital defects in the proper muscular balance. Of course it stands to reason that if muscular paralysis or weakness is due to some central lesion, such as a clot on the brain, as in apoplexy, or to an obstruction to the proper conduction of the central nervous impulse by some lesion in the spinal cord, the proper method to pursue is to remove the clot or the obstruction in the conductor; but, nevertheless, local muscular development is indicated in the treatment of these cases. First, it is indicated along with the treatment for the removal of the central trouble, unless, of course, the nature of the central trouble be such as an acute inflammation, which may contra-indicate it.

The advantages of the local treatment in this stage are, first, it keeps up the nutrition and prevents atrophy and contractions; and, second, it keeps up the strength, so that the slightest improvement in the central trouble is manifested by the improved state of the muscles, as they are in condition to take advantage of the central improvement.

It is well known that in certain forms of central disease peripheral applications have very beneficial effects by reflex action. There are some cases which have previously suffered from a spinal or a brain trouble, the central lesion continuing so long that the muscles, by being improperly nourished, do not regain their proper strength for months or years after the disappearance of the primary disease. I

have seen cases where, for years after an attack of acute antero-poliomyelitis, a limb was yet impaired, and I have seen that limb, after a course of local treatment on the muscles, greatly improved. I do not wish to be understood that I believe every case of paralysis of advanced stage can be cured by local stimulation of the paralyzed or weakened muscle.

A Jewish gentleman of about fifty years of age had a stroke of apoplexy which involved the right arm and leg, and also affected the organs of speech considerably. He was treated by the late Dr. Lilienthal until he left this city to make his home in the West. After nearly three months he recovered his speech and the use of the lower limb so that he could walk for some distance very well, but the limb would soon give out. The arm was in a similar state. He could write three lines almost as well as he ever could, but by the time the sixth line was reached his writing was not legible. This showed that the central lesion must have been in a good condition, as he was able to do intricate things with that hand, but did not have the muscular strength to follow it up. I treated this case for five weeks, giving three local muscular treatments a week, when I found that his power of endurance was quite equal to the left side, although probably not as strong as it was before his attack.

When there is a quantitative increase in electrical reaction with a central lesion, according to my experience, no benefit can be expected from muscular treatment. It is the intention of this paper to speak more of the three latter classes of cases, which come more especially under orthopedic surgery than under neurology.

When we come to the second classification, lesion of the peripheral nerves, we get that class of diseases which follows various forms of neuritis, either idiopathic or traumatic.

I do not believe there is much advantage in treating an acute attack of neuritis by electricity, and the galvanic cur-

rent more often aggravates these cases than it relieves them; but, after the acute symptoms have passed away and left the muscles paralyzed or weak, their local stimulation is indicated, and the result will be very gratifying. In those cases where the neuritis has left certain deposits or other changes about the nerves, of course treatment should be given to remedy it; but, along with this, muscular stimulation should be given.

I have seen many times the best of results following muscular stimulation. When the limb has been paralyzed, due to injury of a nerve by a fracture of the bone, and after the nerve has apparently healed, the limb was left immovable, or at least so weak that it could not be used. The improvement in these cases is so rapid at times with muscular treatment alone that it is easily manifest after each application.

Dr. Wilcox and myself reported two cases last year in which, from accident, there was a complete severing of a nerve of the arm. Dr. Wilcox operated on the cases and united the broken extremity, after which they left the hospital and were not seen again for some time. In the meantime one received treatment with the faradic current, applied locally over the muscles, and the other received no treatment, and neither showed scarcely any improvement during the months which intervened between the operation and their return to the city. Some months after the operation I began treating the muscles with the interrupted galvanic current, and the improvement was noticeable from week to week, showing the benefit to be derived from increase of development of these muscles which had so long been inactive.

What I referred to as functional paralysis or weakness of muscles are those cases which follow joint affections, such as synovitis, rheumatism, etc. I can understand how some of these may be due to an extension of the inflammation to the nerves, and consequently come under the second

class; but, no matter which, the treatment, so far as building up the muscles is concerned, is the same. It will be found that every case of this class will be benefited by this treatment, except when there is some permanent lesion. It will often be found that in a case of long standing of synovitis of the knee joint there will be permanent contractions of the hamstrings, or the same may be true in old cases of lateral curvature of the spine. While it is possible to develop the weakened muscles which act in opposition to the contracted muscle so they will be quite strong, they cannot be developed strong enough to overcome the permanent contraction of their opponents. The same is true if there is a contraction of the fasciæ. It will also be noticed that these muscles lose their strength very rapidly after discontinuing the treatment, which is not the case if there are no contractions of opposing muscles or fasciæ.

The fourth class, congenital defects in the proper balancing of muscles, has been worked on, so far as I know, exclusively by Dr. S. F. Wilcox and myself. There is a class of cases which come to the orthopedic surgeon, mostly children, which may have a peculiar gait in their walk, may have a peculiar twist in one foot or leg, or a crooked manner of holding the head. Any part of the body, in fact, may be found to be slightly deformed. If you examine closely into the cause of this deformity, you will find that it is due to a lack of strength of a muscle or growth of muscles, and which, being unable to cope with the muscles placed in antagonism with them, produces the deformity. The history of these cases will not give you the slightest clew to any cause for the condition. Perhaps the patient has grown to manhood or womanhood before it has been noticed. If you make a careful electrical test, you will nearly always find a quantitative decrease to both currents as compared with the healthy side, more marked, as a rule, when the nerve is stimulated than when the muscles are stimulated. It may

be possible that in a small proportion of cases this quantitative decrease is not noticeable at first testing; but, if you treat the defective muscle and the same group of healthy muscles on the opposite side exactly in the same manner for a week or two, and then make another test, the difference in the quantitative reaction will be more noticeable.

Now, when there is muscular weakness, there is a certain amount of deformity, varying with the location and severity of the injury to the weakened muscle.

It will be remembered that healthy muscles are, as a rule, increased in strength faster than diseased ones by the same treatment. It is, therefore, necessary to be careful in the treatment, and concentrate the action of the current on the weakened muscles and nerves. This is done by carefully going over the motor points of the muscles and nerves which supply them, and not to rub the whole limb with an electrode, so that the healthy muscles derive more benefit than the diseased ones, and, instead of remedying the evil, increase the deformity. This is particularly the case when in those diseased conditions the faradic current does not improve the weakened muscles, but it does the stronger antagonistic muscles. Besides the improvement of the deformity in these cases, the general health always improves. The whole nervous system seems sometimes to be reorganized. Peevish, fretful children become quiet and cheerful, melancholy is changed to happiness, and stupidity to brightness.

One case will suffice to show the great change which sometimes takes place in the general condition of these cases. A little boy, aged nine years, came to me about a year and a half ago. The peroneal muscles of the right leg were very much weakened, allowing the fore part of the foot to fall downward and inward. The deformity was noticeable at a very young age and was undoubtedly congenital. I gave the weakened muscles thirty treatments on

the motor points at the rate of three treatments a week. At the end of the thirty treatments the quantitative reaction was normal with the other side, and the deformity had entirely disappeared. This child, before treatment, was one of the most peevish, fretful children I have ever seen. He was also unable, although he had been in school for two years, to learn anything. He did not know the letters of the alphabet, and could not add three and three. One year after treatment he was able to read some, and would add a column of figures nearly as quickly as I could.

Many clinical cases could be added, but I have omitted them for brevity. Neither do I intend to philosophize on the subject, but hope to hear something regarding the nature of it from the discussion which will undoubtedly follow.

Discussion.

DR. S. F. WILCOX of New York City: It seems to me that all I can do is to confirm what has already been said in the paper, because the cases I have seen have been those which have come under the author's observation. The results of treatment have, however, seemed to be remarkable—in fact, I think they are equal to orificial treatment, or any of the many new fashionable methods. Of course the cases must be carefully selected, and all cases of deformity or of paralysis cannot be benefited in this way. For instance, in the class of cases spoken of in the paper—those in which the muscles are not only contracted, but the muscles themselves have undergone change, so that instead of muscular structure they resemble fibrous cords—the deformity is, of course, permanent, and electricity can be of no use whatever. Such cases are purely surgical. Among other cases suitable for such treatment are cases of lateral curvature of the spine. Lateral curvature cases may be divided into two classes—those in which the curve may be strengthened, or perhaps reversed, and those in which it is utterly impossible to strengthen the spine because the muscles which hold the spine in the improper position have been permanently altered. Nothing short of myotomy will suffice in this latter class. Now that this subject has been brought up

before the society, I hope that another year will develop further interesting facts in connection with this subject.

DR. NEISWANGER : I would like very much to express my appreciation of this paper. In our clinic lately I had a case of poliomyelitis anterior with a resulting contraction of the tendo-achilles. The patient was a child of six years who had never walked a step. My treatment was very similar to that described in the paper, and I can testify to the vast improvement which took place. At present there is no atrophy of the muscles, except possibly in the gluteal muscles. At last Friday's clinic the child was given the tenth or twelfth treatment with faradism, and at this time it was able to put its foot on the floor and walk four or five steps. One of the students asked why I used faradism in this particular case, but I could not reply further than to state that our meager knowledge of the pathology of this lesion prevented our selecting the method of treatment with greater intelligence and precision.

DR. JACKSON : I think I have seen marked benefit from the galvanic current in the early stages of acute neuritis, using the positive pole at the seat of pain, and the negative pole at the spine near the origin of the nerve. Three cases which I have had under observation in the last few months seem to be decidedly benefited by a labile application of the galvanic current of not more than 16 milliampères.

POST-DIPHTHERITIC PARALYSIS TREATED BY STATIC ELECTRICITY.

BY WILLIAM L. JACKSON, M. D., BOSTON.

A young lady, aged eighteen, was brought into my office on October 5, 1893, having the following history: Six weeks previous had a severe attack of diphtheria, but in three weeks was able to be about again. Soon noticed slight difficulty in swallowing, and her speech became affected. The legs grew weak, so that she could not stand. Was much depressed by her condition.

She came to my office in a carriage, and was supported in walking by two persons. When left alone, she totters and falls. There is marked weakness of the muscles of the arms and legs, with numbness and prickling. She cannot walk alone. Entire absence of knee and elbow jerk. No ankle clonus. Cannot hold a cup in hands without its falling. Sensation as of something remaining in the hands after putting object down. Flesh feels soft and flabby. In the fauces the muscles on the left side are markedly paralyzed. Speech is thick and nasal. Complains of knot in the back at the waist line. Weight 113 pounds. Appetite fair; bowels normal. Examination of urine revealed nothing.

On examination electrically there was no change qualitatively, but there was diminished response to the faradic current in the muscles of both legs.

She was put under treatment at once with static electricity, negative insulation, positive breeze. Massage and sparks were applied to the weakened muscles and to the spine. Length of treatment twenty minutes, followed by half an hour in a recumbent position.

Treatments were given at intervals of from two to six days, and in two weeks she was able to walk without falling and to go upstairs alone.

At the end of three weeks began giving galvanic current to the spine, positive pole on cervical region, negative at the base, 5 to 10 milliampères ten minutes. This was followed by the static treatment.

Patient made rapid progress, and at the end of two months reported that she had danced once, though the knee jerk is still absent. The voice has lost its peculiar nasal quality and she speaks without difficulty.

By the end of the third month she reported herself better than before the diphtheria. Is gay and cheerful.

Improvement continued, but it was not until six months after I first saw her that the knee jerk became normal, and I could discharge her as cured. She gained decidedly in flesh, and all her functions became healthier than before her sickness.

A marked effect of the treatment was the regulation of the menses, which had previously been too frequent and excessive, as well as painful. After each treatment she said she always felt buoyed up and exhilarated, and as if she could endure any amount of fatigue. This is a common experience, and I am in the habit of cautioning my patients not to give way to this exhilaration, lest they lose the good effects of the treatment.

Many cases of diphtheritic paralysis recover without treatment, but I feel that in this instance the return to health; and, in fact, to a better condition in many ways than existed before the illness, was largely due to the electricity.

RESEARCHES ON THE ACTION OF THE GALVANIC, FARADIC, AND FRANKLINIC CURRENTS ON NERVOUS TISSUE.

BY W. Y. COWL, M. D., BERLIN, PRUSSIA. PRESENTED
BY DR. J. T. O'CONNOR, NEW YORK.

That all electricity is fundamentally one and the same is a fact long since accepted by physicists, but it is also a fact, not less well established, that the effects of its various forms upon the organism differ largely from each other.

The three common forms of electricity, which we know as galvanic or constant, as faradic or induced, and as franklinic or static, result from their different manner of production, and are distinguished from each other by their rate and manner of discharge, which is constant and continuous in the case of galvanism, intermittent, inconstant, and alternating in direction and intensity in faradism, and intermittently instantaneous in franklinism.

We may graphically represent these differences in a perspicuous and vivid manner by comparing the flow of a galvanic current to the outline of a house with a flat roof and upright ends; that of the alternating faradic currents, first, in the case of the sharp current occurring on opening the primary circuit of an induction machine, to the outline of an obelisk or an Eiffel tower; and secondly, to indicate the reversed course of the weak current occasioned by closing the primary circuit, to the outline of a blunt pyramid or low hill as appearing inverted on a surface of water in front of it; and finally that of the franklinic discharge, as from a Leyden jar, by a simple vertical line, in part remembrance of Franklin's historical kite string.

These comparisons indicate sufficiently that in typical franklinism we have a current of electricity of great intensity, but infinitesimally short duration, while in faradism the one current resembles the franklinic, and the other

a slight approach to an interrupted galvanic flow, which, for its part, begins at once with full intensity, and ceases again as suddenly on breaking the circuit.

Respecting the effects of electricity on the organism, we find them of two fundamental kinds, namely, first, functional, and second, molecular, and these are combined in different proportions in the case of each of the three, or, as we have just detailed, the four, common forms of current.

In the strengths employed on the organism the galvanic current produces the least functional and the greatest molecular action, the franklinic discharge, on the other hand, the least molecular, *and, for the same quantity of electricity*, the greatest functional, effect, while the faradic current holds an intermediate place.

Upon using the galvanic current, both in experiment and in practice, we find that its chief functional effect, namely, muscular contraction, appears only when letting on and shutting off the flow, or at the moments of its instantaneous rise and fall, and not during its continuance, while the molecular effects, which, under different conditions or aspects, we denominate polarization, electrotonus, chemical action, and electrolysis, vary with the duration of the current, being inappreciable when this is instantaneous or momentary, being both marked and lasting in its effects when of moderate length, and being destructive of tissue when inordinately continued.

The muscular contraction which ensues on opening as well as on closing a galvanic circuit containing a muscle or nerve within it, namely, upon the fall as well as upon the rise of the current, has been, in general, considered to be directly due to the same. There can be no question that the current acts directly by its rise, but with reference to its fall or stoppage the theory has been held that the functional effect observed was due to the rise, at the same moment, of the polarization current, resulting from the accumulated molecular effects at the two poles or points of

application. As a matter of fact, when arrangement is made for its observation and flow outside the tissue or tissues polarized, such a current, having a reversed direction to that of the original current, is to be noted as soon as the latter is cut off. This current sinks with the polarization, of which it is one of the outward expressions, at first rapidly, and then more and more gradually to nought.

The theory is that, even when the mentioned outside arrangements are not made, such a current occurs in the tissues themselves; but experiments demonstrating that it is the polarization current which causes the functional effect on opening the battery circuit, and not simply the fall of the galvanic current, have not yet been adduced. The most recent and pretentious effort in this direction has miserably failed, owing to the unfamiliarity of the enthusiastic author with the literature of the subject and his dependence upon mathematical deductions. On the other hand, Fick and Gad, by employing a galvanic current, not instantaneously, yet momentarily, sinking to nought, have found that a muscular contraction, incited by this fall, begins immediately upon its commencement, instead of at a later point, when the polarization current makes itself apparent. This may be taken as conclusive that the latter current does not cause the excitation.

How the rise and fall of the galvanic current produce incitation—incitation having every resemblance to the normal nervous impulse—is unknown, but there are strong reasons for the view that the incitation in each case consists in the change effected in the electrical condition of the nerve; a view which stands in conflict, moreover, with none of the various facts that have been ascertained with reference to nervous and muscular action.

The chief reason for the same is the circumstance that electrical excitation ensues only upon a change of strength or intensity in the current applied, and not during its even and constant flow.

Such a change may be the letting on or shutting off of either any simple current alone or of an addition thereto, and it yields in both cases a similar effect. The next reason is that the normal nervous impulse is not an electrical current coursing along the nerve like the galvanic current; for whereas the latter has a velocity of 290,000 miles per second, the nervous impulse, natural or artificial, is propagated at the rate of 100 feet in the same space of time.

There is, furthermore, no discernible anatomical provision for the coursing of electrical currents through the nerves, for the latter are not circularly continuous, but terminate in unconnected endings.

If the nervous incitation, then, consists in an electrical process, of which we have no doubt, it must be a transmission of an electrical condition of the tissue from one point to the next along the nerve.

According to the general law of du Bois Reymond, the amount of excitation of a nerve increases directly with the suddenness of the rise of the current of electricity passing through it. The two faradic currents, for instance, which, as measured on the galvanometer, show an equal quantity of electricity, vary directly in functional effect with the shortness of the time in which this quantity is given out. We have here a difference which we may compare to that between the magnesium flashlight and the slow, dull burning of the same metal when lying in a heap together.

The quantity of electricity necessary to excite a nerve, when directly applied to it, is so small as only to be measurable by the most delicate reflecting galvanometers. This excitation, evinced by a muscular contraction, will, under favorable circumstances, be occasioned by one-half the current of a Daniell cell when lasting only two ten-thousandths of a second. If the current be continued for one-thousandth of a second, the contraction will be fully equal in amount to that occasioned by any length of application of the same.

A franklinic discharge, on the other hand, though lasting but two-millionths of a second, will produce the same effect, owing to its comparatively great intensity. In this case, though the intensity of the current is great, the duration is so infinitesimal that the total quantity of electricity may remain likewise exceedingly small. A vivid idea of the minute quantities of electricity requisite for nervous excitation is given by the employment of a simple telephone without a battery when the tips of the connecting coils are laid upon a nerve. On calling certain vowels, such as A, O, and U, into the instrument a muscular contraction, under favorable conditions, will ensue.

The considerations under the last head show especially how slight a change in the electrical condition at any point of a nerve may suffice to start an incitation within it, and they furthermore exclude the necessity of a current to effect the same. Considering, then, altogether, that nervous incitation results from a change in electrical condition, the question of the origin of the incitation upon the fall of the galvanic current is, in general, answered, and we say the change in the electrical condition of the respective tissue, which takes place owing to the removal of the current at this moment, effects the incitation.

The essential nature of the electrical incitation, which is doubtless identical with the natural one, is, as before said, undetermined; but there are grounds for believing that both of them are intimately connected with a momentary polarization of the part excited, as we shall further on detail.

The condition of marked and temporarily lasting polarization of nervous tissue occasioned by the continuous flow of the galvanic current, which, with its inherent peculiarities, was discovered by du Bois Reymond and named by him *electrotonus*, has since been divided into *catelectrotonus*, occurring at the negative pole, and characterized by increased excitability at that point, and *anelectrotonus*,

distinguished by diminished excitability at the positive pole. By means of these latter peculiarities it has been found that electrotonus takes time for its development in appreciable amount, and it has also been shown, as might be expected, that the excitation upon starting the galvanic current actually occurs at the cathode, or site of increased excitability. Upon stoppage of the current or removal of the electrodes, and in consequence of the opposite polarizations developed in the tissue at the points of their application, which, being no longer drowned by the overpowering strength of the original current, may now appear and act alone, all of the foregoing conditions become reversed; catelectrotonus appears where the anode, or positive pole, had been, and it is now from this point that the incitation starts out. In this case of the fall of the current, just as on the rise of the same, the excitation occurs at the point where an actual change in electrical condition is taking place, and in each instance in the same direction, namely, toward catelectrotonus, or negative polarization.

In further agreement with the fact that time is necessary for the galvanic current to produce directly appreciable polarization and electrotonus of the nerve, and in confirmation of the view above expressed respecting electrical excitation, we obtain, when the galvanic current is allowed to flow but a moment of time, a functional effect only on closing the circuit, and not on opening it.

When with currents of ordinary intensity we still further reduce the period of flow, no appreciable response occurs, and this fact forms a further reason why we consider that the incitation on closing the circuit is due not to the mere flow of the current, but to the change in electrical condition of the tissue excited; for any change in tissue requires time, while the flow of a galvanic current may be said to begin instantaneously with its full force. This change, as before indicated, may well consist in an immediate polari-

zation that, when the circuit is closed but for a moment, disappears in so short a time that we cannot appreciate it with the physical instruments at our command.

A certain support for this view is the fact that, while nerve cells and nerve endings, for instance, soon tire out on electrical excitation, the nerve itself will continue to transmit impulses indefinitely without exhaustion.

Such a functional polarization as that inferred stands, however, in marked contradistinction to the pronounced and more or less lasting polarization of electrotonus, occasioned by more than a momentary length of flow of the galvanic current.

It seems thus that the fundamental difference in the action of electricity directly applied to a tissue, which we characterize by the division into functional and molecular, may not be one of kind, but simply one of degree, governed primarily by the quantity of electricity employed.

In composite tissue, as in the human organism, the differences in the action of the common forms of electricity result in part from the variations in moisture and specific conducting power, as well as in the excitability of the various tissues traversed by the current. To this combination is to be added the different size and material of electrodes, as well as the varying pressure exerted in using them.

All these sources of complication and error are at once removed by the employment of an isolated tissue, preserved, as is easily the case with that of amphibians, from pronounced change during the experiment, while by the self-unpolarizable electrodes of du Bois Reymond a guaranty against disturbing electric currents is obtained.

In this manner the fundamental questions at issue may be attacked with a prospect of being more or less completely decided.

In the foregoing review of our knowledge respecting the

action of electricity upon nervous tissue we have only considered the action of the galvanic current, with which, indeed, previous investigators have mainly contented themselves, owing to the simplicity of the means for its use and control; but in order to render that knowledge of general value and application it is necessary to institute a strict comparison between it and at least one of the other commonly employed forms of electricity, which has not hitherto been done.

Owing to the evanescent character of franklinic electricity, and the difficulty up to the present time of measuring both the intensity and duration of its individual discharges, not to speak of the course of their rise and fall, the faradic currents come first under consideration, and to these chiefly, as well as to momentary galvanic currents, the present researches have been devoted.

As long since determined by Helmholtz, the current induced in the secondary coil of a carefully constructed faradic machine, on opening the primary circuit, is only less fleeting and difficult to measure than the franklinic current, which it also resembles in its general effects. This fact, together with the circumstance first observed by Bernstein, and repeatedly noted in our own experiments, that this secondary faradic opening current, when passed through a high resistance, such as that offered by a nerve, oscillates in direction during the brief time of its existence, precludes its satisfactory employment in exact investigation. The faradic closure current, on the other hand, presents a far greater relative duration, which is exactly measurable and divisible by the ordinary methods of precise research, and possesses in no case an oscillatory character.

In the present experiments, by means of a new, simple, and exact method of determining, through the reflecting galvanometer, the maximum intensity of this current, as well as its quantity, duration, and the course of its rise and fall, all its physical factors were ascertained, without

recourse to the uncertain and time-consuming employment of the electrometer in either of its forms.

The object employed in these researches was the sciatic nerve, isolated, together with the gastrocnemius muscle from well-grown frogs, previously sacrificed to the purpose.

The instruments were : 1. A standard du Bois Reymond induction machine, graduated in the galvanometric manner which we have described in the JOURNAL OF ELECTROTHERAPEUTICS for July and August, 1891, together with a Daniell cell of great constancy, owing to the employment of sulphate of zinc solution instead of sulphuric acid. 2. A du Bois Reymond spring-rheotome-myograph with three current breakers, two of which were micrometrically movable along the path of the carriage for the smoked glass plate for receiving the tracings of the muscular contractions. 3. A Wiedemann reflecting galvanometer, rendered doubly sensitive by an encircling ring of finest soft-iron wire some two pounds in weight, and accompanied by the usual millimeter scale and telescope.

For the special purposes of the research a solid soft-iron core was substituted for the bundle of soft-iron wires in the primary coil of the induction machine, which had the anticipated effect of greatly prolonging the faradic current induced in the secondary coil on closing the primary circuit.

Instead of thus occasioning the closure current, however, a short circuit to the Daniell cell was broken, whereby its full force was thrown into the primary coil of the induction machine, yielding a current in the secondary coil of almost the same intensity and more complete uniformity. The following observations were then carried out :

1. A determination of the course of the faradic closure current by making a momentary connection between the secondary coil and the galvanometer, whereby its first extremely minute portion was measured, and then repeating the same for succeeding portions. In this manner the

strength or intensity of the current was ascertained at all points, and its course as a whole determined and then graphically described. The resulting figure resembled the outline of a long, low hill, steep at its beginning, soon rising to a maximum of some duration and then falling very gradually to an almost imperceptible end. The time occupied by the whole was fifteen-thousandth, or about one-seventieth, of a second, which for a faradic closure current is unusually long.

Great uniformity and precision were lent to the described procedure by the means employed for momentarily bringing the galvanometer into the circuit of the secondary coil. It was constructed for this purpose by attaching, first, to the nose-piece of an ordinary du Bois Reymond current breaker a piece of thinnest spring brass divergent from the same, and, secondly, a metallic pin on the carriage of the rheotome, connecting with the secondary coil of the faradic machine. In use the pin first made an electric contact with the brass spring, which lasted until the nose-piece itself was struck, when the circuit that had just been effected was again broken. The divergence of the end of the spring from the nose-piece of the current breaker, and hence the duration and quantity of the portion of current sent through the galvanometer, could be varied to suit the sensitiveness of the latter and the desired fineness of the determinations. The duration of the connection was then reduced to the utmost compatible brevity of one ten-thousandth of a second, and the mechanism found to yield perfectly uniform results.

This means of adjustable momentary electric connection, which, so far as I am aware, has not hitherto been employed in physical experiments, seems deserving of wider use; for it avoids the sources of error attaching to the employment either of two current breakers, moved *pari passu*, or of a single current breaker with subsequent calculation of the successive relative current intensities.

By the method here employed these intensities were directly given by the galvanometer.

2. Having thus a faradic current with a fixed and determined maximum of sufficient duration, the chief means were given for a direct comparison with a galvanic current of equal intensity. To this end it was simply necessary, first, to provide means of taking off any desired portion of the current of a Daniell cell, which was readily effected by a rheochord in direct circuit with the latter, and then leading off from two points of the same at adequate distance apart; secondly, a commutator for shunting this branch galvanic current in place of the faradic closure current at any moment; thirdly, an arrangement of the three above-mentioned current breakers on the rheotome so as to cut out either the maximum of the faradic current or the same length of flow of the galvanic current; fourthly, a commutator for shunting either galvanometer or nerve into the circuit of action.

By then varying the distance of the leading-off points on the wire of the rheochord, the galvanic current was rendered exactly equal in intensity or electro-motor force to the maximum of the faradic current, which, like it, now possessed an instantaneous rise and fall.

The two momentary currents were thus physically identical, as far as can be determined by existing physical instruments. They were then submitted to the more delicate test of their physiological action by being sent at consecutive intervals, both alternately and in series, through the prepared nerve. The amount of contraction in the attached muscle was thereupon found to be in all cases the same for any one strength of current.

When, by either moving the secondary coil of the faradic machine alone, or varying the rheochord distance, a slight inequality in the currents was occasioned, the muscular contractions also became unequal in amount, as a proof of the extreme sensitiveness of the nerve to such differences.

As is the rule in experiments with muscle and nerve, this inequality of effect was greater in relative amount than the inequality of the currents producing it, which further confirmed the mentioned sensitiveness.

It is thus made clear, we believe for the first time, that differences in the action of faradic and galvanic electricity, as we familiarly and preferably call them, are not inherent, but must be due to differences in the intensity, duration, or course of the currents employed.

3. Having determined not only the maximum intensity, but also the course of the rise and fall, of the employed faradic current as a whole, and with means of cutting off either its end or beginning, or both, and thus rendering them instantaneous like the rise and fall of the galvanic current, the opportunity was furthermore given for investigating the general difference in effect between an instantaneous and a gradual rise or fall of current. To these ends arrangements were made with two of Pohl's commutators to send through the nerve either, 1, the whole current; 2, the first quarter or first half; 3, the second half or three-quarters; or, 4, a portion of very short duration at either the maximum, which occurred at the end of the first quarter, or at a point in the middle of the current's course.

The results hereby obtained were that both the first quarter, the first half, and the whole of the current all produced the same amount of contraction in the muscle supplied by the excited nerve; furthermore, that the contraction became markedly stronger when the latter portion of the current was applied, even when beginning at the midpoint, where its intensity had already sunken one-third; and finally that the effect of the latter three-quarters, lasting some twelve-thousandth of a second, was equaled by the small portion cut out at the maximum, lasting no more than one-thousandth of a second, while that of the latter half was diminished in correspondence to the lesser intensity of its instantaneous beginning.

Portions of current below one-thousandth of a second in duration, although with maximum intensity, yielded gradually less effect down to about one ten-thousandth of a second, at which point, as in the experiments of Helmholtz with the galvanic current, all response ceased with the moderate intensities employed.

From the foregoing results we draw the following conclusions:

I. That, when of the same maximum intensity, a relatively gradual rise, as in the faradic closure current, produces much less effect than an instantaneous one.

II. That the faradic, like the momentary galvanic, current produces nervous incitation only by its rise, and not by its fall.

III. That, down to a very short period of excitation,—in the present researches one-thousandth of a second,—a difference in the amount of incitation effected by an instantaneously arising current varies only with the intensity, and not with the quantity, of electricity employed.

IV. That, in contradistinction to the franklinic current of enormous intensity and almost infinitesimal duration, both the faradic and a galvanic current, of moderate intensity and decidedly greater, yet very minute, duration, will produce no appreciable excitation, instead of an energetic response.

The first of these conclusions supports the general law of nervous excitation, discovered and formulated by du Bois Reymond, which holds that the functional effect is proportional to the suddenness of the rise of an exciting current, and not to its mere intensity or strength. With reference to faradism, I believe the facts upon which it is based to be the first proof of the generalization as yet brought forward.

The fact that the secondary faradic current on opening the primary circuit causes functional effects that are far stronger than those occasioned by the closure current can-

not be used as a comparison, because of their great difference in maximum intensity, upon which, as the present researches show, the effect also depends, and this instance was not, indeed, adduced by du Bois Reymond in formulating his law. But a similar objection pertains to instances that otherwise, like the two faradic currents, go to indicate the probability of the same; where, for example, by increasing the revolutions of a magneto-electric machine, the individual currents become more sudden in their rise and fall, they also increase in maximum intensity; similarly, on allowing a magnet to fall through a coil of wire from different heights, and therefore with different velocities, a variation in the intensity of the current induced, as well as in the rate of its rise, takes place in like manner.

The above instances have served, nevertheless, together with exact experiments with the galvanic current, to cause the generalization to be long universally accepted, with but one recent exception of a theoretical character, to which we have alluded in another connection. We now see by experiment that the law is sufficiently founded on fact.

The second of the above conclusions, that the faradic closure current does not act by its fall, rests upon the consideration that excitation, occurring upon both its natural rise and fall, would be increased by rendering the latter instantaneous, as it had been on making the rise an instantaneous one. That it was not agreed with the experiments with the galvanic current, which, yielding, only when prolonged, an excitation on their fall, produces a greater effect when the latter is instantaneous, as usual, than when gradually produced. That the natural fall of the faradic closure current has a much slower and more regular *tempo* than its rise we have already noted, which further justifies the conclusion.

The absence in these experiments of what is known in clinical electrology as the opening or break contraction

indicates, as before stated, that the latter is due to polarization developed by the more than momentary current.

The third point, that currents of more than exceedingly short duration, when instantaneous in their rise, vary in functional effect solely with their intensity, strength, or electro-motor force, agrees with the general experience in the use of the galvanic current. That molecular changes in tissue, on the other hand, are measured by the duration, as well as the intensity, of current, in other words, by its total quantity, need only be iterated in this place.

The fourth point, that by reducing the duration of momentary currents we reach a point where quantity as well as intensity, regulates the amount of functional effect, and finally an extreme where the latter results only from the application of enormous intensity, as in the franklinic discharge, shows that a certain minute quantity of electricity is necessary to occasion an effective incitation of the nerve, and that all beyond this simply goes to the production of the less evanescent molecular effects, which, especially in the case of the galvanic current, are often so apparent, as well as beneficial, in their action.

Condensators composed of series of franklinic plates, arranged with connections like a rheostat, for different graduated capacities, which have been recently employed for the investigation of the effects of momentary currents of electricity, yield currents the maximum intensity of which (when the plates of the instrument are of faultless mica) is always equal to the electro-motor of the battery or number of cells employed in any case to charge the instrument, while the quantity of electricity, expressed in micro-coulombs, is determined by this factor, as well as by the capacity of the section of the condensator charged, expressed in microfarads. From these factors, by algebraic calculation, the course and duration of the current may be ascertained.

All currents from condensators, whether those occurring

or charging or discharging them, rise instantaneously to the maximum, and thence fall, at first almost as suddenly, then more and more gradually, to an asymptotic end. They therefore resemble the faradic opening currents as yielded by coils of different construction.

For practical determinations of the effects of currents of different known intensity and fall, with a view to their convenient and economical use, they are admirable; but, as it is still unsettled whether the general form of current produced will take the place in clinical medicine of the alternating faradic currents, especially of the faradic closure current, as weak as it usually appears to be, the question of their practical employment is not yet a pressing one.

For investigation the currents from the condenser, like the faradic opening currents, are of subsidiary importance; for, although possessing necessarily no oscillation, they are available for the exact study neither of the influence of minute differences in electrical quantity, nor of variations in the rise of intensity, while for simple and precise comparisons of the effect of variations in maximum intensity, they are equaled by a galvanometrically graduated induction machine.

Discussion.

DR. J. T. O'CONNOR: The paper gives results many of which are known, but I doubt if many of us fully understand the *modus operandi* by which the results are obtained. The new point of prolonging the fall of the secondary current at the break certainly shows a very decided advance in our knowledge. The author also shows that the polarization is in the nerve, and not in the surrounding tissue—a very novel and striking point. He shows that the recent efforts to introduce franklinic electricity as a substitute for faradism are hardly necessary or even justifiable.

ELECTRICAL MASSAGE IN THE TREATMENT OF DISEASES OF THE EAR.

BY THOMAS L. SHEARER, M. B., C. M., BALTIMORE.

In taking up the subject of treatment of ear diseases by electrical massage it should be understood that the word electrical is here used simply to denote the fact that the motive power by which the various effects are produced upon the aural conducting apparatus is electricity, not that the current itself is transmitted to any part of the ear directly. It is also necessary to state that the kind of aural diseases treated by this method are those included under the class known as chronic. The special forms with which we meet in this group will be referred to later in this paper. Now ordinarily by massage we understand that some kind of manipulation through either simple or complicated movements of the hands is applied to a part of the human body with the idea generally of obtaining as a result one of the following objects:

1st. The removal of any rigidity of the region, and hence improved mobility of it.

2d. The absorption of any inflammatory local deposit.

3d. The improvement of the circulation of the part, and hence increased nutrition of it.

4th. The increase of muscular power of the part, and therefore, as a direct result, the better performance of its functions.

In some of the aural diseases which present themselves to us for treatment we find physical conditions which correspond to some or all of the points just enumerated. Some writer has said very sensibly that it is a good rule for the laity never to put anything into the external auditory canal smaller than the human fist. Clearly according to this we must look to some other method of applying massage to the ear, and of late what is called vibratory motion

has been suggested and tried. But before considering this let us examine into the kind of cases in which we should use mechanical vibratory motion, and endeavor also to ascertain whether it is a reliable therapeutic agent in these diseased conditions. First, then, it may be stated that of all cases of chronic deafness, with or without tinnitus aurium, with which we meet in practice the most common are of the type produced by non-suppurative inflammation of the middle ear. Under this heading we find as varieties:

- a.* Hypertrophy of the tissues of the middle ear.
- b.* Atrophy of the lining membrane of the eustachian tube with corresponding changes in the middle ear.
- c.* Exfoliation of the dermoid layer of the external auditory meatus and of the membrana tympani with secretion of very dry, hard cerumen.
- d.* A condition of more or less rigidity of the tissues with contraction of the tympanic membrane and altered secretion of wax, impairing the hearing. The primary cause of these latter changes has no doubt been an acute suppurative process which was recovered from sufficiently to close up the perforations in the drumhead (tiny scars being in some instances plainly discernible), and following cicatrization the changes in the parts occurred. With this a follicular pharyngitis is apt to be associated.

It is not necessary here to enter into the diagnosis between cases of deafness produced by the causes just mentioned and those in which the auditory nerve is diseased; neither is it essential to refer to adenoid growths of the pharyngeal vault, or to the points by which we rule out and distinguish these different causes of deafness, as they are treated of sufficiently in text-books which cover this special subject. The question before us is: Given the above-mentioned cases of deafness, what results have been obtained with massage applied in the form of vibratory motion to the membrana tympani and its chain of ossicles? Also, under what conditions should we avoid its employment?

1st. It has been used where atrophic changes in the membrane lining the eustachian tube were very marked, with similar alterations in the drumhead, and where the air in the tube was consequently rarified. One frequently found with this condition of affairs that the annoying, persistent symptom tinnitus aurium was present, produced probably from contraction of the fibrous layer of the membrana tympani with secondary pressure through the ossicles, the stapes being forced too firmly into the foramen ovale, with undue pressure in the labyrinth.

2d. In general hypertrophy of the tissues of the middle ear.

3d. In cases which have resulted from old former acute suppurative processes.

4th. In cases of obscure tinnitus aurium.

Now in which of these cases ought we, on *a priori* grounds and from experience with the treatment, to expect improvement, and what, as a matter of fact, has the method done toward modifying the diseased aural conditions? In order to determine these points we must understand the theory of the treatment and its manner of application. The first instrument which I saw used for this purpose was that employed by Dr. Garey of Baltimore, its principle being the formation, by either slow or rapid vibrations of a metallic revolving substance, of a series of sound waves which varied in pitch and intensity. These waves were sent against the membrana tympani with sufficient power to cause in suitable cases vibrations of that membrane and its chain of little bones. The idea was that, if any rigidity of the parts existed, the persistent use of the vibrations would act as a species of massage and limber up the stiffened joints. The column of vibrating air was conveyed by a rubber tube, which was bifurcated in order to allow of its fitting accurately into each ear. The other end of this tube was attached to a rubber chamber, through the center of which was placed a diaphragm, thus dividing the space

into a lower and an upper section. It is now easy to see that any body of air set into vibration by the movements of the diaphragm would be readily transmitted along the tube to the ears. With this instrument I did not experiment because of the necessarily crude nature of its construction and because of its cost. A short time after the introduction of this apparatus I obtained another rather ingenious device called the Violin-Vibrophone, which, by the way, is made in New York. Its mechanism is very simple, is based upon the same fundamental principle as the previously described instrument, and allows one the slow, medium, and fast vibrations, as well as two imitations of the pathological sounds, viz., low buzzing and high singing notes. The main part of the vibrophone is simply the body of a violin, the power of which as a sounding board cannot be equaled. The strength of the current can be nicely regulated, and any reasonable amount of loudness or number of vibrations can be obtained. Its cost is only twenty-five dollars, and with three good Edison cells to drive it, it certainly works well. The dry cells which are furnished with it I did not find very satisfactory. With this vibrophone I have had considerable experience, and after a careful study of each case in which it was tried I have come to the following conclusions:

1st. It should, of course, never be used in acute inflammatory conditions about the ear or where marked pain is present.

2d. It is clearly an absurdity to expect any marked result from such massage where the pathological state is one of exfoliation of the dermoid layer of the external auditory meatus and the membrana tympani with even a slight amount of hardened cerumen.

3d. In people of very nervous temperament, and whose cases are principally examples of tinnitus aurium, it is well to remember that the too sudden impact of vibrations, when they are of the very coarse and loud variety, is capable of

producing a marked degree of nervous shock. One young lady who had undergone treatment for this symptom, with another instrument, however, exhibited all the signs of fully developed neurasthenia, and did not recover for some weeks after the two sittings which she had had.

4th. In old cases of tinnitus aurium of long duration the noises were temporarily drowned by the louder sounds produced by the instrument when they, in some instances, equaled those described in Dante's "Inferno," but after the patient recovered his ideas about things the original sounds went on as before. In other words, while some people who suffered from these annoying symptoms were benefited considerably, others, whose cases were of an apparently similar nature, failed to improve under the treatment. I am inclined to think that the real cause of a failure to relieve such troubles arises from the fact that we do not, in many sufferers, appreciate the actual nature of the tinnitus. Its causation is obscure, and very often we must depend entirely upon a description given by the patient, many of whom, even when well educated and intelligent, are not capable of conveying any approximate idea to the physician when it comes to the simple enumeration of their symptoms.

5th. Treatment should always be begun with sittings of say ten minutes divided up in this way: two minutes with the slowest vibrations, three minutes with the medium and five minutes with the fast vibrations. But in every case one must test very cautiously the susceptibility of the patient, and proceed slowly until such modifications in the application of the massage as may be necessary are made and careful notes entered in a book for future ready reference. By doing this one avoids any risk of injury either to the auditory nerve or to the delicate intra-aural structures. It is also necessary not to prolong the massage in most cases over say twenty minutes, as it is rather inclined to do harm and produce a feeling of nervous exhaustion, the

result of having the prolonged succession of tiny shocks carried so rapidly to the auditory center.

6th. In suitable cases the feeling after a treatment is described by the patient as a sensation of air having been blown through the head from ear to ear—an open condition of the parts.

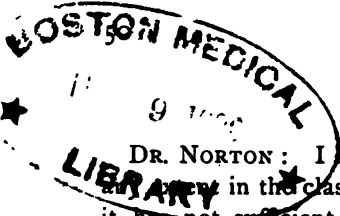
7th. The best results are obtained where a moderate catarrhal condition of the eustachian tube exists with a sensation of marked stuffiness, and where the use of the Pollitzer air bag does not relieve.

8th. Where very long-standing hypertrophy or very marked atrophy of the parts was found to be present no results of any decided character were obtained.

9th. In people whose ears were the seat of only moderate hypertrophy, with consequent partial rigidity of the membrano-ossicular structures, the general effects of the treatments were very encouraging, and certainly ought to urge us to the construction of instruments for still better methods of treatment. The theory which underlies the application of massage to these inaccessible parts is in all likelihood correct to a great extent, but we require better means for the practical use of it.

The instruments look well in one's office, they impress very greatly that portion of every medical man's clientele which revels in the enjoyment of novel and unusual sensations; and while the facts mentioned in this paper would be an additional reason for investing in a violin-vibrophone, yet I must caution anyone against promising his patients who may wish to undergo the treatment any particularly brilliant result before a few test applications of the massage have been given.

I regret to say that, with all the advances made in the province of aural diseases, for some time to come we shall be compelled to realize the fact that odontophones, metallic ear trumpets, and all kinds of serpentine portable speaking tubes are still very fashionable.



DISCUSSION.

Discussion.

DR. NORTON : I have not employed the violin vibrophone to ~~any~~ in the class of cases referred to in the paper. I think it has ~~not~~ sufficient range, and that very little good is to be derived from it. The vibrometer and the organ devised by Dr. Houghton have both given very excellent results in my hands ; but, as I have only used them for two or three years, I cannot say positively beforehand what class of cases will be benefited by them. In catarrhal conditions of the eustachian tube the treatment by massage seems to be very beneficial, resulting in a more patulous condition of the eustachian tube, and in some cases in a very decided increase in the hearing. The massage part of the vibrometer is quite powerful, and I think improves the hearing. Before we were acquainted with this theory of treating these cases by massage I used to employ electricity, applied by means of proper electrodes directly to the external auditory canal, and the membrana tympani, and I think that I did so with good results.

DR. HOUGHTON : In regard to the instrument which has been employed chiefly by the author, I would like to ask the object of the manufacturer in placing the vibrating diaphragm on the belly of a fiddle. It might be just as well placed on a plank. Long ago an apparatus was devised consisting of an ordinary receiver with a stethoscopic arrangement, and the current passed through the receiver from an ordinary secondary coil. As I understand it, that is all there is to the vibrophone, except for the conditions of the violin body. I agree with the writer of the paper in all the points made, except, perhaps, as regards the modification of nutrition of the drumhead and the canal to such an extent that exfoliation takes place, and a decidedly better condition results. Persons who make use of such means quite continuously find that the old material is thrown off and that a better state of affairs is brought about. The exfoliation of the old material increases the conduction and mobility of the parts, and in some instances modifies the nutrition of the tympanum.

One or two experimenters with the phonograph, particularly Dr. Bates of Toronto, have obtained much better and more

permanent results than the majority have succeeded in getting. Dr. Bates says that by substituting for the ordinary cylinder of the phonograph one that is notched, so as to give powerful vibrations, and following this by a still rougher one, and finally by musical cylinders, he has obtained far better results than by any other means. The ear must be treated so as to recognize all the healthy ear can recognize. There are regular and irregular sounds at short and long vibrations, to which must be added the ordinary musical sounds and the finer modulations of the human voice. The cases most amenable to the treatment, as the author has said, are those which have been recently acutely affected. When once the stapes is fastened in the fenestra by pseudo-anchylosis, I can see no hope of it being dislodged. The old cases are relieved only so far as the massage improves the condition of the auditory nerve.

I believe it is possible to modify the mucous membrane of the entire head by such treatment. I can recall one case in which massage changed the character of the secretions of the head so that the patient first experienced a stuffy feeling like that of a cold in the head, followed by a profuse secretion, and then a chronic catarrhal condition. I believe we need the widest range of tone that the ear is likely to hear, and these must be made the basis of our experimentation.

THE PRESIDENT: Has the new sinusoidal current been used in diseases of the ear? I believe this alternating current can be made to give all the massage obtainable by the other instrument, and at the same time give a very short electrical current. This idea occurred to me about one year ago when I was testing the current of a machine which had been constructed in Paris. I attached it to an old stethoscope and obtained what I believe was the same massage as is obtained in the vibrating instruments alluded to by the previous speaker. At the same time a current of electricity was passed.

DR. SHEARER: In closing, I would only state that the dry cells furnished with the vibrophone I found of but little use, but I obtained very good results from the use of from three to five Edison cells for the purpose of driving the machine.

ELECTRICITY IN AURAL DISEASES.

BY HENRY C. HOUGHTON, M. D., NEW YORK.

In response to a request for a paper on the value of electricity in the treatment of diseases of the ear allow me to say that aural diseases offer nothing peculiar in regard to physiology. The same principles that guide in the general application of this marvelous therapeutic force must direct one in its special uses. If one knows these principles, and has a good degree of mechanical skill, there will be no difficulty in adapting instruments to meet the object in view. If one is not thoroughly versed in principles, he or she will make mischief in practice.

The action of a current of electricity in the ascending or descending direction, and the effects produced at the point of entrance to or exit from the body, determine the question of therapeutics. In any specific case the quality of current, either galvanic, faradic, static, or thermal, is simply one of dynamic force, or potency, if you please. He who says: "Electricity is electricity, and it matters little what form is used, or what instrument is used to evolve the force," stands but one degree above the one who says that electricity is a delusion and a snare, and any apparent curative result obtained by its use is purely mental. The time is past when one need waste powder on such an enemy.

The action of a current of electricity is radically different at the point of entrance from what it is at the point of exit. At the first point, the anode, the positive pole, the action is sedative; the circulation is from the part. Acids and oxygen are found there. At the second point, the cathode, the negative pole, the action is stimulating and the circulation is toward the part. Alkalies and hydrogen are attracted to this pole.

With certain well-recognized exceptions to, or rather

modifications of, the above statements, the rule of practice is the same for faradism. The general effect of a current of electricity induced (secondary) in a long, fine wire is very different from that induced in a short, thick wire, and the profession is struggling toward a clearer statement of the therapeutic value of currents produced by varying sizes and lengths of wires by which and in which the force is generated.

Strange as it may seem, there is nothing new under the sun. After a century of experience we are returning to an extensive use of static electricity, from which the profession was diverted by the discovery and application of the induced form by Michael Faraday on account of the simplicity and compact form of the apparatus by which the force was generated. Here also we may observe that we have much to learn, and, for one, I am free to confess that, as in the use of galvanism and faradism, my errors have been in the direction of excessive dosage.

Concerning thermal electricity, the writer has nothing to offer, being engaged in the study of the A B C's of the subject; but there is as much of value, if not more, in the sphere of therapeutics to be derived from the use of this form of electric energy as from either of the better known forms.

Having confessed ignorance, and claimed a very limited degree of knowledge of this limitless subject, all I have to offer will be in the line of instrumentation.

At the outset of my experiments with galvanism difficulties presented themselves in the matter of instruments; the only ones manufactured served to diffuse rather than concentrate the current. It was customary to fill the external auditory canal with warm water, to introduce a speculum somewhat after the form of Kramer's antique and unique instrument, to apply a sponge electrode to the occiput or mastoid process of the temporal bone and pass the amount of current generated by from five to fifty cells.

Even by this crude manipulation effects were produced that were deemed little short of magical. It must be admitted that sometimes the effects disappeared as if by magic. The first step in the direction of better means was the use of an eustachian electrode, made for me under the direction of Mr. Bartlett, then of the Galvano-Faradic Manufacturing Company of this city. This consisted of an ordinary eustachian catheter, through which a wire passed, ending in a spherical tip at the small lumen, and secured by a thread and nut at the large end, in which a tip could be placed connecting with the rheophone and battery. In place of the speculum formerly used, an electrode was devised consisting of a central wire terminating in a small spherical point over which a sponge or charpie could be drawn and secured by a small piece of hard rubber tubing, varying in size according to the caliber of the external meatus. This, dipped in a weak saline solution, and introduced well into the auditory canal, concentrated the current without the annoyances and dangers of maceration of old scar tissue to which one is liable with the use of hot water. In cases where it was desired to apply the current so as to bring into the circuit the tissues of the lower pharynx and anterior and posterior muscular structures, a tongue spatula, with insulated shank, was connected with the ordinary electrode handle. In case it was desired to apply the current to the tissues of the hard palate, well back toward the palatine arch, a similar electrode was devised, differing from the spatula in having a platinum surface superiorly and a porcelain surface inferiorly, and bent at right angles to the stem, so that it could be pressed against the posterior part of the hard palate.

Through a period of twenty years any departure from these simple devices has been futile, and instruments constructed after the original plans are still in daily use. There should be connected with every cabinet or office outfit some mechanical device by which the galvanic cur-

rent can be reversed regularly and rapidly. No explanation is offered for the fact that, if an electrode be applied over the ganglia of the trifacial and over the mastoid process, or at the occiput, and the current commutated, a different effect is produced than is produced by a continuous application of the current in either direction over a period of successive minutes. It is simply in keeping with the physiological fact that, if a current is passed continuously in one direction, exhaustion follows stimulation. The same instruments, the same manipulation, may be used in the application of the faradic or the static current. The only comment to be offered is this: In the use of galvanism with the milliampèremeter we have exact dosage; with the faradic we only approximate the dosage; with the static also we only approximate dosage, unless we adopt some such converter as has been suggested by Dr. A. L. Ranney.

In conclusion, allow me to remark that it advantageth little to quote isolated cases. From the application of electricity in a large number of cases of disease of the middle ear I have been led to the conclusion that the results secured by faradization or by static electricity equal, if they do not surpass, those reached by galvanism. Certainly, in the restoration of muscular tonicity, and modification of the nutrition of the middle ear, it seems to me to be true, and in the modification of subjective noises faradism and static electricity have served me better than galvanism, with the disposition of mind to favor static electricity even above faradic.

Discussion.

DR. SHEARER: I would like to ask the special form of static electricity employed.

DR. HOUGHTON: I have not used the breeze at all. With a carefully prepared carbon pencil and a static induced current the effect of the application is often very remarkable, particularly in the improvement noticed in the tinnitus and in the better per-

ception of sound. We all know that certain patients seem to hear and a moment after there comes the answer, there seeming to be a fault between the conduction of the impulse and the mental perception. Now, in such cases and in people in advanced life, the treatment by static electricity by the simple means just described causes a decided modification in the tinnitus and a better mental response.

The suggestions contained in the profound paper by Dr. Cowl make me wish I were twenty years younger than I am in order that I might more carefully and exhaustively investigate these many new and important points that are constantly arising.

A NEW METHOD OF TREATMENT FOR GOUTY ARTHRITIS OF THE FINGERS.

BY F. A. GARDNER, M. D., WASHINGTON, D. C.

I wish to present to the society a new method for the treatment of gouty arthritis of the fingers, and also show the electrode, which consists of a glass vessel about six inches square and four inches deep filled with potter's clay. At the bottom of this vessel is a metallic plate which is attached to a binding post on the outside.

My method of using this electrode is as follows: To the positive pole is attached a large clay or felt electrode about eight inches square, which is placed between the shoulders. The negative pole is attached to the binding post on the outside of the new electrode.

The fingers are buried in the clay so as to cover all the joints involved, and a current varying from 20 to 50 milliampères is used for fifteen minutes, providing the patient can bear that amount. If not, a lighter current is used for a much longer period. But I find very little benefit is derived from a current below 20 milliampères. Cases of short standing are those most readily benefited. After each treatment I insist upon the fingers having thorough massage, using freely hot vaseline or olive oil.

It is difficult for some patients to bear the high currents, but I have found the improvement much more rapid when 40 or 50 milliampères can be used steadily.

I will refer to but one case, a lady, about thirty-eight years old. Every joint upon each finger was enlarged and had been growing worse for one year. I began with a current of 15 milliampères every other day. This was gradually increased at each sitting until 45 milliampères could be borne readily for fifteen minutes. This treatment was continued with a gradual improvement until the end of

the third month, when the joints presented a perfectly normal appearance.

Discussion.

DR. WILLIAM L. JACKSON of Boston : This subject of removing deposits from the joints is one of much importance, particularly as hitherto we have had no satisfactory method of treating such conditions. I do not see why, if we can remove deposits in other parts of the body, we cannot be able to do so from the fingers.

EDITORIAL.

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ELECTROZONE.

Through the Department of Street Cleaning of this city the New York Electrical Society had the pleasure on October 11 of visiting the electro-disinfecting plant at Riker's Island.

Riker's Island is a small island located at about the junction of the East River and Long Island Sound. It was at first a mere rocky eminence, and was bought by the city a few years ago to be used for the deposit of the refuse, which it was found impossible to carry in the small scows used for that purpose far enough out in the ocean during the rough winter months, as is done during the summer. The channel through which the great vessels pass to and from this port was in danger of becoming obstructed by the garbage dumped so close to the shore that it was washed into it during the rough winter months, and in order to do away with this necessity Riker's Island was purchased, and was used last winter for the first time. Many complaints have been made by the neighboring villages along that part of the coast of the bad odors coming from the island, and the authorities became alarmed about the health of that

section, as well as the effect these might have on the many hospitals on islands in that immediate neighborhood, and the Insane Asylum on Ward's Island, that counts its inmates by the thousands. In their efforts to disinfect the island they thought of the Wollf electro-disinfectant, which a year ago had done such excellent service disinfecting at Brewster's, a small village located in the Croton watershed, from which our city water supply is furnished. This great work, which disinfected the sewerage of Brewster's and so improved the water supply of this city, and which has been made into a permanent plant, was so much discussed by the newspapers at the time that it need not be repeated here. How the Electrozone is generated must be familiar to all, and we will simply say that it is done by a process of electrolysis of sea water, or a saturated solution of salt water. It is claimed by Mr. Wollf that Electrozone produced by the electrolysis of sea water is superior, as it contains more elements than does a mere solution of salt. Four large wooden vats are used on Riker's Island in which several plates of zinc and platinum are immersed in multiple, like the older forms of cautery batteries. The zincs are 12 by 12 inches and the platinum 12 by 15. A current of 10 volts with an ampèrage of 700 ampères is generated by a dynamo and is passed through the plates. A constant stream is pumped into the vats from the sound, and another continuous stream is pumped out that is carried by means of different lines of hose to all parts of the island which have been covered by the refuse. It is estimated that 1500 to 2000 gallons per hour of Electrozone are thus thrown on the *débris*. In order to reach the deeper parts, where the garbage or refuse has been piled some 10 to 12

feet high, round holes 4 to 6 feet deep have been excavated and filled with Electrozone. The result of this treatment was that within a few hours after the beginning to disinfect the island last June the odor lessened, and when we visited the island October 11, there was no odor whatever; nothing more unpleasant, so far as the nostrils were concerned, than would be found in a walk up Fifth Avenue. Chemists from other cities as well as from our own testify that the island is as thoroughly disinfected as it is deodorized.

There is no doubt that Electrozone is a deodorizer of the highest order, neither is there any doubt that it is a powerful disinfectant, but its exact position as a disinfectant has not yet been defined. It probably acts simply as a hyperchlorite. As chlorine has a great affinity for hydrogen, it attracts it away from the oxygen, leaving the latter nascent. Organic matter always contains carbon and hydrogen; oxygen has affinity for both, and when nascent will destroy organic compounds containing them by combining to form water or carbon dioxide, or both. It is claimed, also, that Electrozone made from sea water contains some hyperbromite and hyperiodite, but it is not known in what quantities; they are certainly very small and they probably have but little, if anything, to do with its disinfecting properties. Electrozone is not a new compound; it is undoubtedly practically the same as Labarraque's solution (Liquor Sodæ Chlorate [U. S.]), possessing only the advantage of being manufactured in large quantities, and can be sold at a very low rate. It is claimed by its promoters and also by some physicians that Electrozone has a very wide field in medicine, and that it has been used in several of our hospitals,

but we have been unable to obtain any accurate data regarding it in this respect. Professor Malcolm Leal found that it dissolved vegetable matter whether in a state of decomposition or not, but had no effect upon cellulose. The same author also found that it dissolved the pus of tuberculous sputum, but did not affect the elastic fiber. We have also been informed that it destroys the gonococci of gonorrheal discharge.

Coupling this with the fact that it is non-irritating to the mucous membrane or sores, it may become an antiseptic and thereby lend a helping hand to modern surgery. No matter whether it ever becomes a medicine of value or an antiseptic in the strictest sense or not, it has a wide field of usefulness in the medical profession, and it is hoped that it may receive from it the attention that it merits.

ELECTROPOISE.

The readers of this JOURNAL are perfectly familiar with the instrument known as the Electropoise, as we have made mention before of its quackish nature. The Editor of this JOURNAL was at one time besieged with letters of inquiry regarding it from physicians all over the country. The reasons for these letters were due to the fact that a William N. King, M. D., of this city, a man unknown to us, had written of a wonderful case which had been miraculously cured by it, and which formed a part of a book distributed like the quack medicine almanacs throughout the country. The difference in the middle initial had not been noticed by the physicians who inquired regarding it, and they had consequently written for further particulars. The strangest thing to us was that physicians did not at once see the

quackishness of the instrument ; they evidently did not, or they would not have written to inquire seriously about it. When one saw the little book, however, and noticed the ingeniousness with which it was gotten up, and the dignified manner with which they claimed the virtue of regularity, the wonderment was lessened, but not entirely dispelled.

The electrical journal *Electricity* is probably seen by only a few of our readers, as it is devoted to the mechanical and art side of the subject, in which it occupies a leading position. In its issue of November, 21 a long article is devoted to the exposing of this instrument. This journal insinuates first that the instrument patented is not the instrument sold ; it also claims that chemical analysis has proved that the cylinder contains only sulphur and graphites. That it contains sulphur was known to us before. By means of a reporter sent to the salesroom they obtained from the man in charge the theory of the supposed action on the human body ; this we were never able to get, although we have visited the place twice for that purpose, both times the salesman being very non-communicative on that point.

The small copper cylinder containing sulphur and graphites is immersed in ice water. To this cylinder is attached an ordinary flexible rheophore, to the other end of which is fastened a small nickel-plated clasp which is placed around the ankle. As the cylinder cools in the ice water they claim that the body becomes polarized, and that in this state it absorbs oxygen. Just what is meant by the polarizing of the body we do not understand. The absurdity of such a claim is well given in the article mentioned, and were we addressing any class except scientific physicians we should copy it.

The quackishness of the Electropoise has been so often exposed to readers of medical journals that we feel that we are able to bring it directly before only those who know all about it, but we can urge upon every physician, and especially all workers in electro-therapeutics, who must necessarily have more than ordinary interest in exposing it, to use all their personal influence to expose all these fraudulent claims in the vicinity in which they belong. For, as we have often stated, the time for any quack instrument of this kind to flourish against the united efforts of the medical profession has passed. Let us, therefore, all unite in sustaining the editor of *Electricity* in his gallant fight for the right.

We publish among the book reviews a sketch of the first volume of a work on the electro-therapeutics of gynecology, edited by Dr. George Apostoli of Paris. The work is made up, as one will see by referring to the review, of selected articles of writers from all parts of the world. We call especial attention to this book, as the articles have been chosen from vast numbers by Dr. Apostoli himself, and therefore their excellence and reliability is unquestioned.

BOOK REVIEWS.

TRAVAUX D'ELECTROTHERAPIE GYNECOLOGIQUE. Par le Dr. G. APOSTOLI.

We have just received from Dr. Apostoli of Paris a most interesting and valuable work on the use of electricity in gynecology.

The first article consists of a remarkable series of cases, 106 in

number, comprising all the uterine tumors treated by the Keiths, father and son, of Edinburgh, up to the end of the year 1888.

No attempt has been made to tabulate the results, but they are certainly most satisfactory, and after reading them over one cannot but agree with the conclusions of the elder Keith that it is a scientific and valuable method of treatment. In speaking of the failure of the method in certain hands he is inclined to attribute the fault to the operators themselves rather than to the method of Apostoli, according to which all the cases were treated. He thinks the fault lies in lack of care in introducing the electrode into the uterus, the use of too strong currents, and in burning the abdomen by the use of improper electrodes.

This article was published in 1888, and numerous other articles from all over the world are given in the order of their appearance.

Professor Playfair, in his address before the Congress of Leeds, held in 1889, arrives at the following conclusions :

1. The continuous current is of great value in gynecology.
2. As it is a powerful agent, it may do much harm in unskillful hands.
3. It requires for its proper application very costly apparatus, careful attention, and a great expenditure of time.
4. As the proper application of this method requires special knowledge and training, as well as great care, it is not likely that it will ever come into very general use.

The book also contains a long article by Dr. Massin, assistant to Professor Slavianski of St. Petersburg, entitled "A Historical Study of the Apostoli Method, with Clinical Observations." It is an exhaustive review of the subject, including fifty-six carefully prepared histories of cases.

Two articles from the pens of German physicians are also given, and a contribution from the clinic of Professor Chrobak of Vienna.

It includes histories of all kinds of female affections to the number of ninety. The work concludes with two short articles by a Hungarian and a Pole respectively.

There are altogether over seven hundred pages, and, taken as a whole, the work certainly forms a remarkable monument to the genius of Apostoli, to whom we owe this method of treating female affections. The conclusions of the different writers, while

eminently conservative, all unite in approving the method. Considering the great number of cases reported, and the various sources from which they come, including almost all civilized countries, the weight of evidence which the work carries in support of this theory is simply enormous.

A MANUAL OF HYGIENE. By MARY TAYLOR BISSELL, M. D.
New York: The Baker & Taylor Company, 1894.

The subject of hygiene to-day gains rapidly in importance, and the increase in the number of text-books is remarkable. One of the last, though not the least, of these works is the one above entitled. Dr. Bissell should show her best knowledge in the chapters on physical development, and so she does, yet other topics are not neglected.

The author perhaps devotes too much time to the discussion of past customs and methods, and too little to those methods of examination in vogue at present.

The subjects covered are micro-organisms, air, climate, soil, water, food, dwelling, ventilation and heating, garbage and excreta, growth and development, exercise, individual hygiene, clothing, baths, school hygiene, infectious diseases, disinfection, and finally, a brief account of the cause and prevention of the principal infectious diseases.

It is to this last chapter that the physician naturally turns, for he, or she, naturally wishes to know what to *do*. In this chapter we find practically a *résumé* of some material found in Nuttall's little book entitled "Hygienic Measures in Relation to Infectious Diseases."

The book as a manual is among the best, and should be in the library of every physician who hopes to keep up with the phenomenal advancement of the present time.

EPITOMES.

TREATMENT OF ACUTE TONSILITIS WITH THE GALVANO-CAUTERY.

BY GEORGE H. QUAY, M. D., OF CLEVELAND, O.

The following cases were cited by Dr. Quay in his paper read at the Medical Society of the State of Ohio meeting, held in Cincinnati last May :

CASE I.—Mr. M., æt. twenty years, had chills three or four days ago, followed by an aching and sore throat—almost impossible to swallow ; left tonsil greatly swollen, extending to the uvula ; exudation covered the mouth of the crypts ; right tonsil beginning to swell. Pierced each tonsil four or five times with the galvano-cautery. Pain stopped at once.

CASE II. Mr. W., traveling man. Both tonsils very much swollen. Had had half dozen similar attacks. Cauterized each tonsil three or four times. Pain subsided in two hours. Has had no further return of the trouble.

CASE III. Mr. B. had had previous attacks, and was confined to the house for three weeks with the last attack. Each tonsil was punctured three or four times. Pain ceased in two hours.

The doctor uses a "cherry-red heat." He carries the curved electrode from one-half to two-thirds of an inch into the crypts.

GALVANO-CAUTERY TREATMENT OF CORNEAL ULCERS.

BY GEORGE F. KEIPER, A. M., M. D., OF LAFAYETTE, IND.

Dr. Keiper says that it is always easier to treat a burn of the size of an ulcer on the cornea than to treat an ulcer there. The doctor, in a paper in the *Indiana Medical Journal*, says that he thoroughly anæsthetizes the eye with cocaine and stains the ulcer with a two per cent. aqueous solution of fluorescein with just enough sodium bicarbonate to effect the solution. This solution leaves the healthy tissue unstained, but makes all ulceration green in color. The ulcer is now dried as thoroughly

as possible, the eye fixed, and the cautery applied to the ulcerated surface. The cherry-red heat is used. Great care is necessary and the ulcer is thus replaced by a clean burn, which leaves a much smaller scar than would be left by the ulcer. If sympathetic irritation is present in the other eye, it will be quickly allayed. Staphylomata very frequently yield to the cautery. The largest ulcers, involving larger parts of the cornea, do not yield to the cautery, and it is unnecessary to use it upon the smallest ulcers.

STATIC ELECTRICITY IN ECZEMA.

Doumer reports in the *Arch. d'Électricité Médicale* results he has attained by the employment of the electric souffle in eczema. Forty-eight out of fifty cases were rapidly and completely cured. The patients were of various ages and included both acute and chronic cases. A machine which will give three-inch sparks is best, and the electrode should have points for the breeze or brush discharge. No difference was noticed in the effect produced by the positive or negative electrodes.

THE ELECTRICAL CURE OF CANCER.

In the *Eclectic Magazine* of May, 1892, Mrs. Emily Faithful tells how she had been operated upon twice for epithelioma, and with no permanent relief; that she was then advised to try the galvanic treatment; that she did so and that the result had "been absolutely satisfactory."

ELECTROLYSIS IN THE REMOVAL OF SUPERFLUOUS HAIRS.

BY DE FRISTE VOGT, M. D., OF CLEVELAND, O.

Dr. Vogt, in the *Louisville Medical Monthly*, says that he uses a galvanic battery of six large cells for the removal of superfluous hairs. A cambric needle, with the point broken off, slightly rounded on the end and gold plated, is connected with the negative pole, and the inactive pole is a sponge-covered electrode. The needle is introduced alongside of the hair into the follicle until

the bottom is reached. The inactive electrode is placed in the hand of the patient. Two or three cells are thrown into the circuit, and in from five to ten seconds a little froth will be noticed about the needle, if the current is strong enough. If the hair is not easily removed, the needle should be again inserted and the current again passed. Do not remove too many hairs at one sitting.

TREATMENT OF UTERINE DEVIATIONS BY FARADIZATION.

Regnier told the Société d'Électrothérapie in 1893, says the New York *Therapeutic Review*, that, notwithstanding the accumulated proofs of the efficaciousness of faradism in the treatment of uterine deviations, it is rarely used. Contractions of the uterus cannot be produced by any known method which cannot be satisfactorily replaced by abdomino-uterine, lumbo-uterine, or lumbo-pubian faradization which is but little, if at all, painful. Uterine faradization is indicated in retroversion and retroflexion, and sacro-uterine faradization in anteversion. The application should not be made until three days after the end of the menstrual period, the séance should last for three minutes, and at the beginning should be repeated three times a week and later but two times a week. The strength of the current should be sufficient to cause slight uterine contractions perceptible to the hand holding the uterine electrode. A thick wire induction coil must be used and the interruptions should be frequent. Rarely more than from ten to twenty treatments are necessary. They should be continued longest in versions complicated by flexions or in cases accompanied by vaginal and perineal lesions. Vaginal faradization with Récamier's speculum or the bipolar exciter must be added to the treatment in the first case. It is well to remedy the perineum's insufficiency by perineorrhaphy in the second case—it does not cure deviation, but permits fairer chances of success in electrical treatment. Two anteversions were respectively almost cured or remarkably improved, one at the seventh and the other at the tenth application. Three patients were cured who had retroflexion and retroversion, and one

with anteversion. This application obviates operations that are not always successful. Operations and pessaries should be reserved for cases of inversion and complete protrusion, as they are the only cases in which faradization cannot produce satisfactory results, even when well applied.

COMPLETE PROLAPSE OF THE UTERUS CURED WITHOUT OPERATION AND WITHOUT ARTIFICIAL SUPPORT.

BY A. H. GOELET, M. D., OF NEW YORK.

In the *Charlotte Medical Journal* is related a case of complete prolapse of the uterus which Dr. Goelet cured with the faradic current. The patient, aged twenty-six, had borne no children, but had had three miscarriages at about the second or third month; had been afflicted with complete procidentia uteri for the past three years, and it had resisted other modes of treatment; the vaginal walls and vulvar orifice were much relaxed, and the uterus protruded constantly, while she was on her feet and even when in the recumbent position; the perineum was intact; no form of pessary could be retained. The uterus was replaced and stimulation by the coarse mill faradism. After the first application, made at the office, she immediately rode home, three miles; the uterus did not descend for three hours. Treatment repeated every day until the uterus was retained the whole twenty-four hours, and this only required seven treatments. Then treatments were given every other day, and later, twice a week. She was under treatment for three months, and the cure was complete.

GALVANISM AND UTERINE DYSMENORRHEA.

Dr. Hiram N. Vineberg of New York, in the *Post-Graduate*, says that dysmenorrhea due to "spastic contraction of the internal os" is best treated by intra-uterine galvanism. From twenty to thirty ma. should be used and *not* as much as the patient can bear. This will be almost painless, and the most superficial cauterization will be caused. Usually from six to seven treatments (bi-weekly) will suffice. A large felt or clay pad, or a gauze-wire electrode wrapped in a moist towel and attached to

the anode, is placed upon the bare abdomen, and the cathode (an ordinary uterine sound, with a hole near the handle to "fix" the pin of the cord, will do) is applied just beyond the internal os in the uterine canal. A gum catheter can be drawn over the sound for insulation; turn on the current gradually. Five minutes will suffice for the application. Be sure of your diagnosis and then be thoroughly aseptic, and the results are sure to be on the right side.

ELECTRICITY OR HYPNOTICS IN THE TREATMENT OF INSOMNIA.

BY S. H. MONELL, M. D.

In the *Times Register* is a paper on "Electricity or Hypnotics in the Treatment of Insomnia," by Dr. Monell. The doctor says that persistent insomnia gives more trouble to the physicians than all other symptoms, except excessive pain. Either the galvanic, faradic, or static current may be successfully used in the treatment of insomnia. The patients usually say that they "feel as if they could go to sleep" after the electric applications have been made to the most widely separated portions of the body. The doctor prefers the galvanic current, if the application is made at the patient's home; but he uses the static if the patients present themselves at his office. These treatments seldom fail.

FARADISM IN GONORRHEA.

Dr. H. T. Webster, M. D., of Oakland, Cal., in the *Massachusetts Medical Journal*, says that several years ago a carpenter, possessing "the most active case of gonorrhea" he ever saw, called on him for treatment. The penis was swollen enormously, priapism nearly constant, and the aching was almost unbearable. As the patient was fulfilling a contract and the time was almost up, he could not be incapacitated from work, and he demanded prompt relief. The doctor introduced an urethral electrode one inch into the urethra and connected it with the anode, and the cathode (a sponge) was placed in his hand. The faradic current was turned on and in a few minutes the pain was lessened, and after twenty minutes the relief was so decided that he departed

for his work. He returned for treatment the following day, and the former treatment was repeated and small and frequent doses of aconite and jaborandi were also given. The faradism was repeated every day for ten days. The cure was complete and left no sequel.

THERAPEUTICAL APPLICATION OF STATIC ELECTRICITY.

BY G. FRANK LYDSTON, M. D., OF CHICAGO.

Dr. Lydston, in the *Medical and Surgical Reporter* for July, gives the following cases from his practice :

CASE I. A physician, æt. forty, neurasthenic. Insufficient sleep and irregularity of eating, added to family troubles, had ultimately produced the neurasthenia. The liver was somewhat enlarged, constipation, and the tongue was heavily coated. Static application was made, and on his return the next day the patient remarked : "Doctor, ever since yesterday I feel as exhilarated as though I had drunk considerable champagne." Eight weeks' treatment cured.

CASE II. Miss A., æt. sixteen, lateral curvature of the spine. Massage, electricity in various forms, gymnastics, etc., had been used with little effect. The daily application of the static current to the muscles of the affected side and to the spine induced rapid improvement, and the curvature after a few months' treatment was corrected by a light spinal support.

CASE III. Miss B. was troubled with frequent flushings, severe headache, palpitations, and general weakness ; occasional gastralgia, and her menses had been suppressed for six months. The static breeze was applied to the entire back and "sparks to the spine." The menses reappeared within a month after beginning the treatment, recurred in two weeks and soon became quite profuse. Stopped treatment and the menses became normal. The patient's general symptoms otherwise improved but slightly. On account of the headache she was referred to an oculist, who discovered a considerable degree of astigmatism. A proper glass corrected this, and she was discharged cured.

CASE IV. Male, æt. eighteen. Osteo-periostitis of the femur

in the vicinity of the great trochanter, occasioned by a severe contusion of the hip some ten years previous, from which he had suffered considerable pain and tenderness in the affected part, Static treatment caused a marked amelioration of the pain, the enlargement of the bone diminished, and the prospects are good for a permanent cure.

CASE V. Male, æt. twenty-two. Gonorrheal arthritis of right knee ; slight ankylosis, which had been broken up from time to time and passive motion used. The daily application of the static current instituted a rapid improvement, and in ten weeks the patient was discharged cured.

CASE VI. Male, æt. forty-five, loss of sexual vigor. Ten weeks' treatment with the static current caused a restoration to his normal condition of virility.

CASE VII. Male, æt. thirty. Impaired sexual vigor, and for two months had had a severe pain in the small of the back, which was aggravated by changes in the weather and by sexual intercourse. Upon examination, the meatus was found to be irritable and narrow, and at the depth of half an inch in the urethra was found a large-calibered stricture ; prostatic urethra exceedingly tender and irritable. Anterior urethrotomy was performed and sounds were passed every few days without any improvement. Static current was applied to the lumbo-sacral region, and in a week the pain had almost entirely disappeared. In three weeks was discharged cured. Three months after, from overwork in damp weather, the pain returned, but one application of the static current gave complete relief.

ELECTRICITY FOR THE PAIN OF CANCER.

At the late meeting of the New York Academy of Medicine, A. D. Rockwell, M. D., said that incurable cancer would be incompletely treated if electricity had not been tried. In a case which he had previously reported, from 100 to 175 milliamperes were required to relieve the pain. Large clay electrodes were used. In his opinion the relief was mechanical and chemical, influencing the vasomotor nerves, hastening the circulation, and the pressure upon the nerves of sensation was thereby relieved.

ELECTRICAL MISCELLANY.

—Howard S. Straight, M. D., in the *Western Reserve Medical Journal*, in a paper on "Electro-puncture of the Tonsils," says: "Altogether, my opinion of electro-puncture is not good, and I fail to see any great necessity for its use."

—The *Kansas Medical Journal* tells us that Dr. Ingalls thinks "that at least two weeks should intervene between the cauterization of two sides of the nose, and three or four weeks between operations on the same side."

—The phenomenon known as electric sunstroke is now attracting special attention, by reason of its frequency among workmen employed in melting metals by means of the electric processes. The intense voltaic arc between the carbon and the metal to be melted emits rays, producing a sensation similar to that of a burn on uncovered portions of the body. There is frequently great pain, sleeplessness, and in some cases fever. The skin becomes copper-colored or bronzed, the eyesight is sometimes temporarily lost and followed by what is known as yellow vision, with a sensation of sand under the eyelids. The most effective remedy is perfect rest in a subdued light, which causes the symptoms to subside in a few days, the copper skin peeling off, and the patient regaining his old condition of sight and health.—*New York Medical Times*.

—"Cases with painful, dragging sensation in the pelvis, lack of tonicity in the uterus and its integuments not attended by inflammation, may, in many cases, be greatly benefited by the use of electricity; faradic, current of quantity, positive pole to the uterus per vaginam, negative to hypogastrium; alternate, changing suddenly from weak to strong currents, ten seconds of former, five seconds of latter at every change. Treatments daily; duration of treatment, ten to fifteen minutes. In weakness of anal sphincters same treatment with positive pole inserted in anus, is sometimes sufficient to restore strength to same."—*E. H. Pratt in the Journal of Orificial Surgery*.

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ORIGINAL ARTICLES.

INTER-UTERINE CATAPHORESIS.

BY WILLIAM HARVEY KING, M. D., NEW YORK.

The subject of electrical cataphoresis is so well understood, particularly by members of this society, that it is not necessary for me to make any remarks on the general subject of cataphoresis, but to confine myself strictly to its inter-uterine application.

I have treated corporal and cervical endometritis, and that other form of endometritis known as membranous dysmenorrhea, fibroid tumors, and areolar hyperplasia. I have not, however, prosecuted my experiments far enough in all these cases to speak with positiveness; but with endometritis I have met with such marked success that I feel that I am justified in reporting a case, leaving to the future the developing of its position more accurately in the other diseases.

The first instrument I used to carry the medicinal agent into the cervical canal was a small platinum sound on which a film of cotton was wound. While this has its advantages, it also has its disadvantages. One is, it is difficult to introduce a small pledget of this kind, and it is

necessary to use one that thoroughly fills the cavity, which makes it still more difficult; and, second, in attempting to introduce it after the cotton is saturated, one will be sure to lose a very large per cent. of the medicament from pressure, and which, lodging in the vagina, will do harm if of a caustic nature. There is, also, a slight danger of removing the sound and leaving the cotton in the cavity. Since this first application I have used various instruments. The one I use at present is constructed of a staff of hard rubber tubing eight inches long, one end of which has a split tip for connection with the rheophore, and on the other is screwed the hollow tube which serves as a receptacle for a medicament. Through this tube runs a copper wire, and within one-half inch of the end, where a platinum wire is soldered which continues for one inch beyond the end of the shaft, it is thoroughly sealed to prevent the medicine from running up it. To the end of this shaft is attached by a screw a hollow sheath, which is also made of hard rubber, and filled with longitudinal slits or thickly perforated with round holes for the escape of the medicament. By slightly rotating this instrument during treatment the whole surface of the membrane can be brought into contact with the opening of the sheath. This receptacle sheath is made of three sizes, so that one can be selected that will completely fill the cervix or body of the uterus. In the latter case I use a shaft which is slightly curved, and the receptacle sheath is $1\frac{1}{2}$ inch in length, but otherwise the same. This instrument, if kept clean, will always be ready for use. If it is not kept clean, salts will collect around the thread where the receptacle sheath screws to the shaft, and difficulty will be experienced in screwing it on and off. In such a case thoroughly soaking it in hot water for a few minutes will dissolve the salts, and the screw will be workable, as the threads are in the hard rubber only, and consequently there is no metal to corrode.

In treating a case the first step, after the treatment has

been found to be indicated, is to find the largest receptacle sheath that will enter the cavity. If it is found that either the external or internal os is so constricted that it will not admit a sheath of sufficient size to firmly press the walls of the uterine cavity,—and this is generally the case with the internal os in endometritis,—dilatation should be performed, for it is very essential that the sheath should come in close contact with the diseased tissues. It is also essential to have a good opening for drainage. A film of cotton is wound on the platinum point projecting on the shaft, and the receptacle sheath thrown over it. It is then dipped in the solution or the cotton may be saturated before it is applied. The electrode is then placed in position, while the negative pole is placed over the abdomen, and a current of from 15 to 25 milliampères for from eight to ten minutes is given. This treatment has been so successful in my hands in obstinate cases of cervical and corporal endometritis that I have thought best to give the results of one case.

Nullipara, cervical endometritis. This case had been treated by various methods, but with slight success. One year previous to my treating her she had had an abscess in her right groin. Otherwise her history was good. She had suffered several years with leucorrhœa—in fact, she did not know how long. On introducing the speculum great ropes of tenacious mucus were seen hanging out of the cervical canal, and which, if you undertook to remove, would string out a foot in length. An erosion covered about one-half of the cervix, and, when the ropy mucus was wiped away, the same eroded condition could be seen extending up the canal. Treatments were begun in January, 1892. Before the treatment the canal was thoroughly wiped out with cotton wound on a small probe, leaving the clean, eroded surface. The application was made twice a week, using the compound tincture of iodine, and with the form of electrode I mentioned as first using—cotton wound on a sma¹¹

sound. Not more than 20 ma. were given. A good regimen or diet had been recommended by a physician who had perseveringly treated her, so there was no necessity for any change in this respect. In all, eighteen treatments were given when I pronounced her cured.

I report this particular case for two reasons: First, it occurred more than two years ago, and the case on last examination, September 10, 1894, remains well; and, second, this case had been treated by all kinds of caustics with only slight temporary relief, and, furthermore, the application of iodine for upward of four months had been made by one of her previous physicians without any permanent benefit. It is, therefore, evident that the cataphoric action of the current was what produced the desired result. Its curative action is most marked when the glands are the seat of the disease, and less so when the interstitial tissue is principally affected. Now the reason why this case, as well as others I could report if time permitted, was so promptly relieved, while the caustic treatment failed, I think is very simple. Here we have a condition of glands which, in health, secrete a little mucus, which keeps the canal moist, but they have been so changed by the diseased condition that they pour forth immense quantities of thick, ropy mucus. At the best the ordinary caustic treatment, unless it be sufficient to produce immense sloughs, only affects these glands externally, and does not reach their secreting parts.

So thoroughly has this been recognized that one of the greatest living gynecologists of this country has, within the last few years, entirely abandoned the caustic treatment of cervical endometritis, and only recommends the performing of an operation by slitting open the external os, if necessary, scraping the canal as deeply as possible, and cauterizing with nitric acid so as to produce a slough deep enough to discharge the glands by means of the cataphoric action of a medicament.

We, in the first place, set the iodine free, molecule by

molecule, each individual effect thereby enhancing its action as a whole, and by their migratory progress, under the influence of the current, they are carried deep into the tissues, and come into direct contact with the secreting surface and glands and all the deeper seated tissues.

Time does not permit me to report any more cases in full, neither has my experience been sufficient to form statistics that would be of value, but I would say that the case I have reported of cervical endometritis represents more the rule than the exception, and no less brilliant is the success when we consider the more obstinate disease we have to treat in corporal endometritis. I believe it will also prove to be of great service in membranous dysmenorrhea, as well, perhaps, as many other diseases, but which only experience can tell.

Discussion.

DR. ALICE B. CONDUCT : Have you had experience with other drugs besides iodine ?

DR. KING : I have used chromic acid and various other remedies, but I have not had sufficient experience with them to speak definitely as to their value. I think that a saturated solution of iodide of potassium has given me the best results.

DR. GARDNER : I have enjoyed the paper very much because it touches upon a subject in which I am greatly interested. I have employed the intra-uterine treatment, using iodine and iodide of potassium separately, and also a combination of iodine, iodide of potassium, and carbolic acid, using the platinum electrode wound with cotton. I think there is very much more in the treatment than we have any idea of. I would like to know if anyone has had any extensive experience with the Gautier copper electrode in the treatment of these conditions. I have used it quite a little during the past winter, and have obtained what I consider to be remarkable results, especially in cervical endometritis.

DR. FRAZER : I have also had considerable experience with the method just alluded to by the last speaker, and have obtained very excellent results in both corporal and cervical endometritis.

DR. GARDNER : If the inner os is sensitive, I find that severe colic follows the treatment ; but if Mr. Waite can make an electrode insulated where it touches the inner os, I think this could be largely obviated.

THE PRESIDENT : Do you think the colic is due to the action on the electrode itself, or to the absorption of copper ?

DR. GARDNER : I think it is due to the absorption of copper, and its direct action on the sensitive nerves at the inner os. I use from 10 to 25 milliampères, ordinarily about 12 milliampères.

DR. FRAZER : In this method, owing to the closeness of contact, the current is very dense.

DR. GARDNER : It is just at the internal os that we do not need the current. I think that it is here that most of the current passes, owing to the close contact, as remarked by the last speaker. I find that after using the positive pole, either with a platinum or copper electrode, in many cases there will be a sanguineous discharge after each treatment. I at first thought it was owing to my stupidity in employing the treatment, but I found that after curetting such cases the endometrium was generally covered with vegetations. It is probable, therefore, that the action of the current on these vegetations produces the hemorrhage. Where vegetations were not prominent, there was usually no such bloody discharge.

DR. JACKSON : I can corroborate the experience regarding the hemorrhage following this form of treatment. I believe Gautier claims that this is not common, and should not occur if the current is reversed, but my experience has been that the hemorrhage almost always takes place. I think it is due to the fact that the copper pole becomes glued to the endometrium, and in its removal some small blood vessels are ruptured.

THE PRESIDENT : The first directions regarding the reversal of the current—*i. e.*, only for a minute or two—I believe were insufficient, for I believe the current should be reversed for a considerably longer time, and that it should be quite strong. Four minutes should be quite sufficient time. I have had two cases of severe hemorrhage after using the positive pole with a platinum sound. In these cases there were submucous fibroids, and the canal was so small that the sound was grasped very tightly. On

removing the electrode, notwithstanding the strong current had been used, there was a very profuse hemorrhage.

DR. FLORA A. BREWSTER : I have found that the application of camphor-phenique before making the application lessens the pain, but I have also suspected that it rendered the patient more liable to hemorrhage, for I have found that the local application of camphor-phenique, repeated several times, has caused hemorrhage.

DR. YOUNGMAN : I have had considerable experience in the treatment of endometritis. Twenty years ago I was associated with my uncle, who was a specialist of the old school. He always impressed upon me the importance of putting the application directly on the membrane, and said that in order to do this the membrane should be made perfectly clean. Now after introducing a speculum, with the woman in the Sims position, I wipe out the vagina quickly with a solution of peroxide of hydrogen 1-10 ; then I hold the cervix in place with a special instrument, after which I introduce a dilator and dilate the cervix. I believe the pain comes from the contraction of the fibers of the internal os chiefly, although it is possible that the fibers throughout the canal may be productive of this pain. The patients rarely make any objection to my holding the dilator in the canal three or four minutes. The canal is wiped out with peroxide of hydrogen, then with a mixture of iodine and carbolic acid, and after this cleansing I introduce a probe and allow the reverse current to run for five to ten minutes, as I agree with Dr. King that it is important not to be in too much hurry about this part of the treatment. Since I have employed this method of dilatation I rarely observe flowing or any other trouble after the application of the electricity. Again, I think we often do not discriminate sufficiently between our cases. Many cases of endometritis of long standing should be treated by curetting before a resort to electricity. I use a small aluminum curette, and sometimes even resort to a mild curetting in the office, although I am aware that many are opposed to such a practice.

DR. GARDNER : I believe that the Gautier method is going to largely take the place of the Apostoli treatment, for I do not believe American women will stand the high currents employed

by Apostoli. I recall a case of a young lady of twenty years who had been through the usual treatment for cervical endometritis without benefit. I made seven applications with a copper sound about three-sixteenths of an inch in diameter. The treatments were given about one week apart, and improvement was noticed after each sitting. After the last sitting it was found that the os, which had at first been exceedingly large, had returned to its normal condition, so that it would only admit an ordinary probe.

DR. FRAZER : At one time I watched the work of Apostoli for a few weeks. He rarely used over 100 milliampères, and he had not a milliampèremeter in his clinic which would register over 200 milliampères.

THE PRESIDENT : About eight years ago I also watched Apostoli, and he did not think at that time that any current under 150 milliampères was of much use ; he usually employed 250 milliampères.

DR. JACKSON : I was at Pozzi's clinic three years ago. His assistant, Le Grand, did most of the work with 150 milliampères of current, as the patients usually complained so much of the pain with stronger currents. It may be that many of the patients in Apostoli's clinic were treated with weaker currents under the direction of assistants.

THE VALUE OF THE INTERRUPTED GALVANIC CURRENT OF HIGH AMPÈRAGE IN DISEASES OF THE LIVER.

BY LORENZO J. KOHNSTAMM, M. D., NEW YORK.

Our distinguished and much lamented colleagues, Drs. Æsculapius and Galen, were certainly clever diagnosticians in maladies that affected the abdominal viscera. True, they did not enlighten us to any extent on the subject of physiology, which was a closed book to them, but they had, judging from the petrified boluses recently exhumed in the neighborhood of the houses tenanted by their best patients, the *S. P. Q. R.*, a few good remedies and a large modicum of sound horse sense, with which they practiced more than with their drugs.

They knew full well that every well-organized human being had a liver, and they understood the attention it needed at all times. It was an organ for which both gentlemen expressed profound regard when they met in consultation over a prostrate conqueror, and they always considered it carefully before deciding upon a plan of treatment. Sad it is to relate that some of the greater and brighter medical luminaries of this progressive age have wandered away from the good example they set. To them and to many of us the liver is not what it used to be; still overfeeding and overdrinking are practiced now to a greater degree, probably, than they were when Drs. Æ. and G. were hurriedly summoned to reclaim with their emetics the glorious feasts that had disappeared into the interior economy of some Roman Cæsar.

What can I say of the liver physiologically, anatomically, or concerning its function that you do not already know?

In a few words let me sum up the duties and functions of this organ. To my mind no gland in the human body plays a greater rôle than the liver. Its function is an

important one. In the very first place, it is one of the great scavengers. Its work consists of separating the useful from the useless, just as we separate the wheat from the chaff. It makes and stores up the glycogen, which is to be called into play when heat and muscular energy are required. Again, it secretes the bile and doles it out to carry on digestion. It destroys the peptones which are poisonous, and in its conservative way turns them into glycogen. Further, it carries off other organic poisons which have been formed in the alimentary canal during digestion, and which have been introduced into the system from without. Now, let me ask, does an organ with such important duties not merit most careful consideration in our healing art? The diseases that form the topic I intend to discuss this evening are: active and passive hyperæmia and cirrhosis of the liver.

In active hyperæmia we have no pathological change. We find the organ is enlarged in all directions, with a firmer feel than normal to the touch; at the same time its consistency is really diminished. This condition is caused, according to the best observers, to an overindulgence in food rich in hydrocarbon, and to the free use of wines and liquors. It also occurs during and after pregnancy and during the menopause.

A word about passive hyperæmia. In the early stages of this malady the liver is larger than normal, the increase in size corresponding to the degree of congestion; the consistency, too, of the organ is increased, frequently amounting to stony hardness. The causes of this condition are in all likelihood due to habitual constipation and a sedentary life. These causes may, as they often do, operate singly, or we find both combined responsible for the changes in this organ. Again, the sudden suppression of long-continued hemorrhage, such as menorrhagia or bleeding hemorrhoids, is directly traceable to sudden attacks of passive hyperæmia. The symptoms of this condition are so well

known to all of us that I can pass them over and proceed with the further consideration of the third form, namely, cirrhosis. Pardon me for dwelling at some length upon the pathological changes of this condition. I feel myself obliged to do so in order to bring forcibly before you the action of the galvanic current upon the structural changes in the organ.

The anatomical changes in interstitial hepatitis begin in the connective tissue covering the smaller twigs of the portal vein and gradually extend to its larger branches. The hyperplasia consists in the formation of a soft pulpy mass which makes its appearance first in the portal canals. This mass consists of an immense number of small round cells, which soon undergo fibrinization and form new connective tissue which contracts and becomes organized. This new tissue, in contracting, presses on the portal capillaries and liver cells, and gradually encroaches on the intralobular structures, thus causing atrophy and consequent disappearance of the cells at the periphery of the lobules, while those at the center undergo fatty degeneration. The bile ducts and hepatic capillaries suffer from compression, and the cells around the central vein become bile-stained. I have prepared one or two specimens which, perhaps, will demonstrate the state of affairs we find, ocularly, far more expressively than any words of mine. In the first stage of cirrhosis the liver is slightly enlarged, it is resistant and hard to the touch, the edges are round and smooth. In the second or stage of contraction the organ becomes smaller than normal, now presenting the characteristic hobnailed appearance. It is now hard, rough, leathery, and granular. Excessive indulgence in alcoholic stimulants we generally admit to be the prime cause of this retrograde metamorphosis; gout, rheumatism, malarial passive hyperæmia, are also contributing factors. It is principally with this latter form of hyperæmia and its structural changes that I desire to deal in this paper. Before proceeding, let me con-

sider in brief the older form of treatment that has been practiced and is in vogue up to the present day. I shall mention a few cholagogues and hepatic stimulants more generally used, like calomel, podophyllin, hydrastin, colchicin, iridin, and the dilute acids. We have all tried their efficacy, along with others, and we know, unfortunately, that their action is only palliative and rarely curative. Your time and the scope of this paper do not permit me to enter into detail upon the therapeutic action and value of these drugs; it is therefore that I pass over to the newer remedy electricity, which interests us all at this moment.

In searching for references and the bibliography I was struck by the entire absence of almost everything pertaining to the treatment of the liver. In looking through the authors I find only the following statements; they are short and concise, and I quote them *verbatim*: Liebig and Rohe (1890) state:

"No effects are produced upon this organ by the electric current so far as our present knowledge extends."

Beard and Rockwell (1892): "The pains that accompany this disease may be relieved by electrical applications, and it is possible that the disease might be arrested, provided the treatment was begun early and faithfully carried out. We have known one case to be somewhat benefited that way."

Rockwell (1894): "Atrophy of muscular and nerve tissue we know to be amenable in many instances to the mechanical and nutritive effects of electrical applications, but when the secreting cells of the liver atrophy, because of the compression due to excessive overgrowth of connective tissue, all efforts to stop the progress of the disease avail but little. Among a number of cases of cirrhosis that have come under my observation I can point to several that have been relieved of some of their symptoms by this form of treatment. General faradization daily, employed together with applications to the point of endurance

directly through the diseased organ, not only in great measure relieved the dull pain in the neighborhood of the liver, but greatly lessened and for several months kept in subjection the ascites and œdematous condition of the legs that had for two months been prominent and distressing symptoms. These results seemed in part to be brought about by the action of the current upon the kidneys, which were excited to a greatly increased activity of excretion."

Thus far reference is only made as to the action of the faradic current, the galvanic current not having been made use of. Let me now quote from the recent book by Drs. Jacobi and Schweitzer of this city:

First. They found, after a series of experiments conducted upon frogs, rabbits, guinea pigs, and man, that upon passage of the galvanic current the red blood corpuscles under the influence of the positive pole swelled up and increased in size, while under the influence of the negative pole they became crenated and shrunken.

Second. That upon two animals that were placed back to back, and a current passed through both from chest to chest, the entire blood in the animal acted upon by the positive pole contained more than twenty per cent. less alkali than that of the animal which was exposed to the negative pole.

These authors, while they are inclined to believe that the majority of cells in the living body are influenced by the cataphoric action of the galvanic current, are not willing to go on record with any positive claim to what extent, if at all, the physiology of the cells is thereby altered. On the other hand, they feel certain that the decrease of the alkalinity of the blood by means of the current must have a very material influence upon cell life. This influence is in the direction of a marked functional activity in the neighborhood of the cathode on account of slightly increased alkalinity and reduced functional activity at the anode in consequence of

decreased alkalinity. These experiments are in line with the work of Dr. M. Milton Weill, who studied the action of the galvanic current upon the gases of the blood. His researches tend to show that the primary action of the current is upon the oxygen in the plasma, which it converts into ozone, and that the effect upon the globules and other constituents is secondary.

[In a paper read by me some two years ago before the Missouri Valley Medical Association I pointed out the action of the galvanic current upon the red blood corpuscles, showing by counts made how in extreme anæmia the red cells were increased in number and tone by the sole use of central galvanization. Since then others have followed the same line of investigation.]

The conclusions I drew in my address at that time are these:

1. The direct action of the galvanic current upon the red blood cells is one of nutrition.
2. It improves the condition of the blood disks, increasing their color and lessening the amount of the small-sized disks.
3. This action of the galvanic current is probably a galvanico-chemical one.

It was while conducting these experiments physiologically with the galvanic current upon the blood, that it occurred to me to direct my attention to the possible therapeutic value of the current in hepatic disease. Hence I began my tests in the fall of 1892 by passing steady currents varying from 10 to 15 milliampères directly through the liver. The result was unsatisfactory. I soon observed that in order to obtain tissue resolution I would have to resort to currents of far greater intensity than a careful electro-therapist would regard as safe to apply to such a complex electrolyte. It was about this time that a so-called current-breaker was introduced to the profession, an instrument which was calculated to permit

the passage of currents of high amperage through the body without the disadvantage I referred to above. I used this contrivance in connection with the galvanic current, and now met with good results where before, with the steady current, I had had nothing but failures for my pains.

My method of treating patients is as follows: The evening before the day set for the first treatment I instruct the patient to take a bath in water alkalized with carbonate of soda, which baths are continued thrice weekly throughout the treatment. The patient is placed in a recumbent



position. The positive electrode is placed directly over the liver and the negative to the lumbar plexus. The electrodes are moistened with a solution of salicylate and biborate of soda in equal parts; the current is now turned on, the meter reading 5 milliampères; the interrupter, registering 660 breaks per minute, is then thrown into the circuit. Slowly and steadily the volume of current is increased, while the number of interruptions are correspondingly decreased. If I now consult the patient's pulse, assuming it to have been normal at first, I find it shows an increase of about 15 beats per minute, and as the amperage is added to, the pulse rises to 100, and often to 105. At this stage the meter records 50 milliampères, the interruptions being 175 per minute and rather forcible. A slight perspiration covers the patient. The respirations have increased to 22, and a sense of nausea is complained of. I now rapidly cut out the cells one by

one, thus shutting off the current entirely. The negative electrode is then transferred to the region of the cervical plexus, and the positive from the liver to the pit of the stomach, and the faradic current with the fine wire coil is pressed into service, so faradizing the entire sympathetic system. The pulse falls to normal, the nausea disappears, and after a few moments' rest the patient leaves the chair, feeling comfortable. This is the picture of the treatment of a typical case, yet it should be borne in mind that the volume of current used in different cases varies, and we must, as we always should in treatment of any kind, individualize our cases.

My case-book contains the records of fifty-two cases treated by me according to this method, and I have selected a few typical examples to bear out the explanation and conclusions with which I intend to close my paper.

CASE I. Mr. R. S., age forty-six, merchant. Had always been an abstainer from liquor till some three years ago, when business reverses caused him to resort to the free use of stimulants. For one year he has been in the habit of taking several drinks before breakfast. He has just returned from a sojourn at Carlsbad, the waters of which have apparently not benefited him. There is considerable pain and tenderness in the hepatic region; he complains of headache, the tongue is thickly coated; nausea alternates with heartburn, and as often as once a day he vomits his food—the vomited matter is bile-stained. His skin is yellow; constipation alternates with diarrhea. Varicose veins of both legs have ruptured within the last month and are a great source of annoyance to him.

Physical Signs—Inspection: There is enlargement of the superficial veins of the abdomen on the right side. Palpation: The liver can be felt; its surface is uneven and hob-nailed; the edges are sharp and firm. Percussion: The area of hepatic dullness is diminished; the left lobe cannot be outlined; the spleen is considerably enlarged. Urine:

Specific gravity 1025, reaction acid, albumin, blood corpuscles, oxalate of calcium. Diagnosis: Cirrhosis, second stage.

Treatment was begun September 26, 1892. A current of 10 milliampères was directly passed through the liver. At the fifth treatment, about one week later, the amperage was raised to 20 milliampères. Thus far the treatment had been well borne. At this date, however, the patient was taken with severe vomiting; this vomiting kept up throughout the night and part of the following morning. General faradization was brought into service, and the vomiting ceased. The following day treatment was resumed; again the same symptoms broke forth. The urine was here examined and found to be strongly acid. Alkaline baths were advised; the electrodes were saturated with salicylate and biborate of soda, and the treatment pushed ahead. Here allow me to state that I noticed throughout the treatment that as soon as the urine became too acid, or the moistening of the electrodes with these alkalies was omitted, the disposition to vomit would return. At the end of the sixth week the amperage had been increased to 22 milliampères; at the end of the second month to 32 milliampères. The enlargement of the superficial veins of the abdomen had decreased, the area of hepatic dullness had increased. At the twelfth week the amperage reached amounted to 42 milliampères; the albumin had disappeared from the urine, while the varicose veins not only did not annoy him, but were hardly noticeable.

One week later, that is, after this patient had been under treatment for three months, he became suddenly jaundiced. With this severe diarrhea set in, which, all medication notwithstanding, lasted six days. I could account for it in no possible manner; the gentleman had abstained from wines of all sorts, and had followed a most careful dietary menu. By the end of the fourth month, with current of 45 milliampères, which was well borne, the physical signs were as follows:

Inspection : The superficial veins of the abdomen are not visible. Palpation : The liver is compressible ; its surface is even ; the edges are smooth. Percussion : The area of hepatic dullness is increased, yet not quite normal ; the size of the spleen is greatly diminished. Urine : Specific gravity 1020, reaction normal, no albumin, no blood corpuscles, large amount of phosphates and oxalate of calcium. Tongue had cleared ; vomiting entirely absent. The skin of his body was white, while that of his face was pink. The varicose veins had disappeared. The treatment was continued for one month longer, when he was discharged an apparently well man. I last saw this patient in April, 1894 ; he was then in perfect health. This was one year and a half after treatment had been discontinued.

CASE II. Mrs. B. F., age thirty-six. The greater part of her life was spent in the South, where, contracting malaria, she was largely fed on quinine. She complained of great nausea, severe headache, and pain shooting up the right side to the right shoulder. She had a heavily coated tongue, an intensely bitter taste in the mouth, some gastrointestinal catarrh, and slight jaundice.

Inspection : There was slight bulging of the right hypochondrium. Palpation : The liver was found enlarged and smooth ; pressure against its under surface caused pain. Percussion : The area of hepatic dullness was increased in every direction. The spleen was enlarged. Blood count : 2,700,000 red blood corpuscles to the millimeter ; white blood corpuscles in over-abundance. Urine : Specific gravity 1022, reaction alkaline, some epithelium, mucus, and the earthy phosphates. Diagnosis : Active hyperæmia due to malarial poisoning.

Treatment was begun February 15, 1893, the current used registering 12 milliampères. Barring some exhaustion after each séance the treatments were well borne. By the fifth week, with a current of 25 milliampères, the patient complained of considerable pain in the region of the positive

pole. The urine was examined and found highly acid. Alkaline baths and acetate of potash internally soon brought the urine back to its normal condition, and with this the pains disappeared. At the end of the eighth week she had a distinct chill with some rise of temperature; her tongue, which had cleared, again became coated. A calomel purge soon re-established her *prima via*. These were the only annoyances noted throughout the treatment. After this her headaches disappeared, also the pain along her right side; the jaundice was replaced by a better color, and her appetite and power of assimilation increased. By the end of the third month the amount of the current reached was 32 milliampères; it was not carried further than this. On palpation the liver was found to be normal, and on percussion the hepatic dullness was found to have largely decreased; so was the size of the spleen. The blood count showed 4,500,000 red blood corpuscles to the millimeter. She felt well, and was discharged after being under my care three months. Five months later she was still in excellent health.

I cannot understand why investigators in the field of electricity have confined themselves only to the use of faradism in the treatment of hepatic diseases. No one would think of attempting the removal of an uterine fibroid with this current, which under no circumstances can bring about tissue resolution.

I have tried faradism in all its forms, but beyond removing some of the symptoms of pain nothing was accomplished, and in cirrhosis to remove the pain alone is a waste of time: we must probe deeper; for we have here a hyperplasia consisting of a soft, pulpy mass which undergoes fibrinization and forms new connective tissue. Hence what we need here is an agent which can bring about resolutions of abnormal conditions upon which the disease depends.

You may think my address top-heavy upon the pathology of these conditions, yet it is only with a careful and com-

petent understanding of the pathology which here confronts us that we can make our proper choice of current to be used. In the specimens which I have here prepared you will find the intralobular structure encroached upon and the cells in an atrophied condition. Surprising as it may seem, it is just these conditions which are overcome by the galvanico-chemical action of this most potent agent.

It is not speculation upon which I base this assertion, but the unmistakable disappearance of the most prominent symptoms, such as varicose veins and hemorrhoids, the characteristic mottling of the skin, which turns from yellow to pink, the clearing of the tongue and urine, which latter returns to its normal condition—all strong evidences of impeded circulation due to structural changes, all evidences of what can be accomplished by this most marvelous agent.

We have yet to learn a great deal concerning the influence of this form of electricity upon the living organism. The influence it exerts upon pain, its general value as a tonic, are the strongest indications that galvanism acts through the nervous system primarily, while its indirect action is upon morbid processes.

Its effect on the circulation, its power to produce congestion and the stimulation of absorption, are a further aid, and the excitement of glandular action probably results from a combination of influences exerted upon the nervous system, the circulation, and the cellular metabolism itself. I lean to the belief that the action of galvanism in causing the absorption of abnormal deposits, or in stimulating this gland when in a state of active or passive hyperæmia, is the combined result of the influences it exerts upon its circulatory, absorptive, and nutritive functions. This is evident if, for a moment, we carefully carry in mind these pathological processes. In the earliest stages there is a marked tendency, as we know, to exudation; later on exudation ceases and absorption becomes the tendency. At

the same time, or somewhat later, we have proliferation and connective tissue, and lastly contraction.

Taking for granted that the organization of new connective tissue has reached its critical point, we have reached a condition which is not amenable to drugs. If, then, such a condition is to be removed, it must be done with some power altogether outside of inherent natural efforts to retain the equilibrium of function, the impetus of which must come from without. The researches of many observers have shown us that in electricity we possess a power to resolve the elements of this organized adventitious tissue. Connective tissue changes, to be affected at all, must be reached by some more potent resolving agency. This power is not a caustic or an electrolytic one; for, if it were, the intervening structures between the diseased area and the electrodes would first become destroyed.

The action, then, claimed from the galvanic current is twofold:

1. An electrolytic action, in which we get a direct disintegration and separation of organized tissue; and,
2. A galvano-chemical action, the results of which are achieved by the action of acids or alkalies at either pole.

In the case of the interrupted galvanic current of high amperage the action appears to me to be purely galvano-chemical.

My conclusions, then, are these:

1. Of the various forms of electricity the galvanic current is the only one which is of positive value in the treatment of the diseases of the liver.
2. Galvanism of low amperage is valueless, while galvanism of high amperage cannot be used on account of its strong local caustic action.
3. The galvano-interrupted current of high amperage is the only one indicated.
4. In the absorption of exudates, or in the stimulation of a gland hyperæmic in active or passive state, it is the

galvano-chemical action of the current which brings about the resolution we strive at.

Discussion.

DR. GEORGE MCDOWELL : I would like to ask with what Dr. Kohnstamm measures the interrupted current.

DR. KOHNSTAMM : The interruptions are so rapid—660 per minute—that the needle of the milliamperemeter will not oscillate, and hence there is no difficulty in measuring the current.

THE PRESIDENT : Is the meter put between the battery and the interrupter, or between the interrupter and the patient ?

DR. KOHNSTAMM : Between the interrupter and the battery.

DR. WEILL : Dr. Kohnstamm tells us in his paper that he has tried the effect of the galvanic current upon the organ, which so far as he knows has not been so treated before. He gives the results in two cases, and they are apparently successful. I think we should consider the subject a little from the physiologist's standpoint. The writer tells us that he used the steady galvanic current in cases of hepatic disease with passive hyperæmia, and with the usual changes in the circulatory organs, and that he had met only with failure. This, I understood him to say, was largely due to the caustic action of the galvanic current of high amperage. Now in an important organ like the liver, which is a great physiological and chemical storehouse, and which is not only a scavenger, but a center of chemical changes upon which nutrition largely depends, why should the current of 15 milliamperes produce such bad results, and why should the interrupted current be so well borne even when of high amperage ? His patients were subjected to alkaline baths, and possibly this may have had something to do with the tolerance of the current ; but I cannot exactly understand why the current in this interrupted form should behave as stated in the paper. The author passed the current directly through the liver, and the removal of connective tissue deposit so effected was probably due to the galvano-chemical action of the current. I wish to emphasize this point once more, for I believe with the writer of the paper that the effect of the current was not due to electrolysis, but to its galvano-chemical

action. I would like also to ask the author his reason for giving these alkaline baths.

DR. KOHNSTAMM : Jacobi and Schweitzer have demonstrated that the action of the current on the blood corpuscles only takes place when the blood is in an alkaline state. When I found the urine of the patient to be extremely acid, I prescribed acetate of potash internally, ordered the patient to take alkaline baths, and moistened the electrodes with alkaline solution. The moistening of the electrodes with such alkaline solution diminishes very decidedly the pain produced by the application. I found that when the urine became alkaline the current was much better borne. In conclusion, therefore, I would state that the administration of alkalis assists the galvano-chemical action of the current.

ELECTRICITY AS A THERAPEUTIC MEANS AT RIVER VIEW HOME, FISHKILL-ON-THE- HUDSON.

BY W. S. WATSON, M. D., FISHKILL, N. Y.

Electro-therapy is to-day a recognized important specialty in medicine. The close analogy of electricity to nerve energy has met the attention of leading men everywhere. Medical men to-day are using some form of electricity in the treatment of diseased conditions. The numerous symptoms which call for electricity enable us to apply it to a variety of conditions. The electro-therapeutics of the nervous system is full of interest. Every day brings us new discoveries of its value in neurasthenic diseases. In neurasthenia, or nerve prostration, there is a hyperæsthesia of the brain, a condition that may, and often does, lead to insanity, if not promptly met. To recognize the early or borderland symptoms of insanity or a diseased brain is all-important; and, since insanity is a recognized disease of the brain, there is now no question as to its curability, the same as in other diseased conditions. Early recognition, however, is all-important. A sound mind is like a sound body. One in health is scarcely aware that he has a liver or a stomach, and so, with a sound mind, our thoughts go on and out. We hardly know we are possessed of a mind. When some bodily part becomes diseased and pain results, we are impressed with the fact of having structural parts. When our thoughts are reflected and give us mental pain, we may be assured that mental disease exists to a greater or less degree. To trace the line of separation between a sound mind and an unbalanced or slightly diseased one, where they gradually shade into each other, is where the nicety of discrimination comes in. Symptoms which are unmistakable to the trained eye are too often ignored, or attributed by friends to anything but the real cause; thus

much valuable time is lost, and slightly mentally disturbed cases are allowed to drift on from week to week. The insomnia which means so much goes on unheeded until a general break-up comes. It may be pretty safe to conclude that so long as man holds his emotions, temper, appetite, and will under subjection he is sane. When he fails to so control them, he is within the borderlands of a diseased mind. Mere eccentricities or peculiarities are not necessary indications of insanity, but often are so closely connected as to require close study and careful thought to draw the line. The idea, which is too prevalent, that, upon the first indication of a deranged mind, the one so disturbed must be shut up in an insane asylum, and to hurry off to an asylum an overworked, worried, sleepless individual, and place him in contact with such associations, such scenes, as necessity there imposes; where all sorts and conditions of madness are more or less congregated together; where the incessant moans and lamentations of the thoroughly demented are heard hourly day and night, is erroneous. What can be more humiliating to a man that has any intelligence or sensibility left than to be compelled to mingle with nothing but madness, and to have a tyrannical and often ignorant attendant over him? Such ordeals are certainly well calculated to add depression to an already depressed mind and hurry it on to an incurable condition. When the aberration is of recent date, give the patient cheerful surroundings, separation from business cares, and all that had to do with the production of the condition, or that is likely to call to his mind anything that has become painful. Separation from home and its environments is a long step taken in the right direction. A private institution, with cheerful, refined companions as attendants, where the moody are separated from the more cheerful, where each case is treated strictly upon its own merits, will return to their homes and families thousands that would, under a mixed asylum incarceration, live on a life of chronic dementia. Cases of slight maniacal

excitement, melancholy hypochondriacs, are, to a large degree, manageable—yes, curable—under modern methods, with the aid of electro-therapeutics. A maniacal patient, one that is more or less violent, restless, abusive, and full of delusions, will often pass from the excited period in from one to three weeks under judicious management. Relieve the tension and hyperæmic conditions by brisk cathartics, and the application of electricity to the brain—a continuous current, one that will produce tonic contractions—and there will be improvement almost from the first. Of course various adjuvants to electricity are more or less necessary for a time, but, after all, electricity does the work very largely. Some cases of dementia, those irritable, foolish, inattentive cases, are made much more tractable by the warm electric bath, or static insulation, or the static breeze.

As electricity improves muscular nutrition, so does it improve brain and nerve nutrition by bettering the circulation. The good effects of electricity in nervous diseases are generally conceded; its influence upon the sympathetic ganglionic nervous system, secondarily on nutrition and secretion, is too well known to be doubted; we are able to powerfully affect the circulation through the vasomotor nerves, cardiac branches of the sympathetic and pneumogastric nerves. If we are able to affect the circulation by means of electricity, may we not do great good in the hyperæmic conditions found in our mentally disturbed cases? I believe such conditions are relieved and many times cured by the proper and careful use of electricity. I further believe that no insane asylum should be without a complete equipment of electrical devices for the giving of electricity, and that, if it was put into use under the direction of one competent to use it, much good could be done: suffering relieved, minds made stronger, and thousands restored to a life of usefulness. I hope that asylum men and neurologists generally will give the matter careful consideration and trial in the mentally disturbed of our land.

Discussion.

DR. ALICE B. CONDUCT of Orange, N. J.: I would like to have the writer give more minute directions regarding the application of the galvanic current. It is a very difficult current to apply directly to the brain. For instance, how is it used in cases of monomania and melancholia?

DR. WATSON: I would probably employ general galvanization, or galvanization of the sympathetic, with mild and interrupted currents. I have seen very satisfactory results, not only in the way of quieting patients, but in the way of arousing patients afflicted with melancholia.

RADICLE ELECTROLYSIS.

BY F. M. FRAZER, M. D., NEW YORK.

In the transit of an electric current there is a complexity of conditions which, to be properly applied to any pathological process, must be carefully analyzed, due consideration being given to each of its factors.

Most prominent among these are noticed the local action, the polar action, and the interpolar action, sometimes referred to as catalysis (*a*), and these constitute the galvanochemical cautery; further, we have medicated electrolysis (*b*) and cataphoresis, as well as the germicidal action of the current, to take into account. The local action is generally caustic at high intensities (*c*). It is the basis on which rests galvano-cautery, and it is modified by the heat, the polar action, etc. The polar action I will consider more at length.

At the anode oxygen, acids, and the nonmetallic chemical elements are liberated, giving a hemostatic action to the pole (*d*). As water in the tissue is carried in the direction of the current (*e*), the tissue about the anode becomes more dry, and the cicatrix is hard and retractile (*f*). At the cathode the alkalies and fluids precipitate themselves, and "the absorptive process is undoubtedly more active under this pole than under the positive" (*g*).

"Humboldt was the first to discover that the excitability of a nerve was increased by contact with an alkaline solution, and diminished by contact with an acid solution. Manteucci maintained, in accordance with these data, that the phenomena of anelectrotonus and catelectrotonus were simply due to these chemical actions, and Becquerel has arrived at the same results. Ominus and Legros opposed to this chemical theory of electrotonus the important observations that, when the current is strong, the electrotonic state diminishes, and then disappears, and that ane-

lectrotonus is induced when the electrode is separated from the nerve by the integument and fatty tissue" (*k*).

However, acids *do* diminish, as alkalies increase, the sensitiveness of a nerve, and undoubtedly this is an important factor, even though it be not the only factor, in causing the difference in sensation of the galvanic poles: positive, sedative; negative, stimulating (*i*). To recapitulate: In the galvanic current the positive is acid, drying, hemostatic, anodyne, and forms a hard retractile cicatrix, while the negative is alkaline, stimulating, liquefying, congestive, absorptive (*j*).

Grotthuess of Leipzig has promulgated an interesting theory to the effect that electrolytic decomposition takes place only at the poles (*k*). True as this may be in a homogeneous substance, it is axiomatic, when we consider that "the amount of a chemical action is the same in all parts of a circuit" (*l*), that this cannot be the case when the current traverses cellular tissue, for there, in the presence of fluid, each solid particle through which the current flows would act as a bipolar electrode on the proximate tissue (*m*).

Besides these there is the so-called trophic influence described by Apostoli (*n*) and the muscular contraction with its sequelæ to be taken into account, but I shall confine myself chiefly to the consideration of the electrolysis.

Apostoli has used unchangeable metallic electrodes, and gets the pure effect of the current on the tissue; for the cathode he uses any metal, as, he says (*o*), none is acted upon. With the positive pole he uses platinum, but also suggests gold and aluminum, as being equally good (*p*). Gautier, by replacing platinum with copper, and using the positive, allows his sound to be acted upon by the nascent radicals, and forms oxychloride of copper ($\text{CuO}\cdot\text{CuCl}_2$). This, to adopt Morton's name (*r*), is metallic electrolysis. That the salt is actually driven into the tissue by cataphoresis is shown by the difficulty in removing the sound after using 25 ma. for a few minutes, and also by the copper

colic which has followed this proceeding. Whether the nascent radicles, free to attack what they can, or the formation of oxychloride of copper with the effect of the salt, be preferable is not yet determined, the followers of each insisting on his method.

Other metals besides copper have been used. King tried iron ten years ago, and discarded it. Goelet has resurrected zinc, and finds that it materially softens the hard cicatrix of the positive pole. But through all these procedures run, modified though they be, the characteristics of the positive pole. I have been seeking for an electrode which would be acted upon by the negative pole, and have chosen aluminum.

Aluminum belongs to Fresenius' third group. "While the metals of the third group act as bases toward strong acids, they also deport themselves as acids toward strong bases. Aluminum, its oxide and hydroxide, dissolves H_2SO_4 to form aluminum sulphate ($Al_2(SO_4)_3$), and in potassa yielding potassium aluminate ($Al_2(KO)_4$ or $AlKO_2$)" (s). Apostoli to the contrary (o), it *is* acted upon by the positive pole, and, though he teaches otherwise, it is also acted upon by the negative pole, which we should expect from the above.

The latter, however, is *not* metallic electrolysis; though a sound of metallic aluminum be introduced, the instant part of it is dissolved by the action of the negative pole that part ceases to be metallic. As we have seen, Al may be a metal or a nonmetal, and the portion dissolved from our sound becomes the former or the latter, according as our electrode is anode or cathode. The amount of the element deposited—the action on the sound—it seems to me, should be the same, viz., $C \times T \times \text{Chem. eq.} (= \frac{\text{at. wt.}}{\text{valency}})$, *i. e.*, in ten minutes with 10 ma. the sound loses approximately half a grain. Practically, however, I find this is not the case, the size and shape, *i. e.*, the surface exposed, as well as

the consistency of the metal seem to change it. Four aluminum wires, two of them with 50 ma. for ten minutes, and the others with 10 ma. for fifty minutes, show a marked difference in the loss of weight, the loss being much greater with the small amount for a long time (*t*).

Parenthetically, the figures are extremely interesting and instructive bearing on the question of dosage and time. Apostoli and Engleman dogmatically demand high intensities and short sittings, the latter going so far as to charge the failure of former operators to their too feeble currents. On the other hand, Gautier and his adherents quote both physiologists and electro-biologists in favor of small currents of long duration.

From my experiment—the number of coulombs is the same—I should conclude that both are, to some extent, right. In galvano-chemical cautery the shorter proceeding is preferable, the action being more on the tissue and less on the sound; in medicated electrolysis, where we desire the maximum action on the sound, the longer the better. Personally, I am in the habit of using higher intensities with platinum than with copper or aluminum, and of prolonging the séance more with the latter metals.

A current run through a solution of NaCl, contained in two U tubes, plugged at the bend with plaster of paris, the electrodes in the one being platinum and in the other aluminum, shows a distinct difference of reaction in the two tubes.

In the former at the positive pole is found free Cl, shown by iodide of starch paper, and more unmistakably by the nose; a solution of litmus is bleached. In the latter the iodide of starch paper fails to show any change, there is no odor, while litmus is turned red. Incidentally I should remark that "the soluble salts of aluminum redden litmus" (*u*).

With the platinum I have liberated Cl; with the aluminum I have formed a chloride, neutralizing the solutions

with sodic hydrate. I obtain from the latter the "bulky precipitate of Al hydroxide."

At the negative pole both solutions are alkaline, and the presence of aluminum in the fluid which had the Al electrode is readily demonstrated.

When the aluminum is acted upon by the positive, theoretically an oxychloride is formed, and with the negative an aluminate of sodium, or, in animal tissue, a mixture of several aluminates (*v*). The Humboldt chemical theory of the difference in sensation at the poles has already been discussed, and that, even though it be not the only element causing the difference, it necessarily has its effect seems clear.

Gautier, in forming his oxychloride, of necessity must neutralize part of the acid of the positive pole, and therefore, in proportion to the truth of the theory founded on Humboldt's investigation, and to the action on the sound, part of the anodyne power of the anode.

In the use of aluminum with the negative, which, in contradistinction to metallic electrolysis, I call acid, or radicle, electrolysis, as the Al electrode is dissolved to form the acid radicle, the aluminum combines with the bases; therefore, as less free alkali can exist, part of it being neutralized by its action on the sound, there should be proportionately less pain, and it is my impression that this assumption is clinically warranted. From this I deduce the general law: Action upon an electrode tends to diminish the characteristics of the acting pole.

It has been objected that the salts are carried in the direction of the currents by cataphoresis, and, even if an aluminate were formed at the negative, it would not be driven into the tissue. But we must not forget that some substances (such as BaBr,) are carried from the cathode to the anode (*w*). Whether this is the case with the aluminates I am not prepared to say, but it is as certain that the electrode adheres to the tissue as that aluminum can afterward be demonstrated in the cathodal cicatrix.

Concerning the germicidal action of the current, I regret that I can say but little. Apostoli tells us that it takes 300 ma. to kill the bacteria of carbon, 200 being uncertain, and 100 useless (x).

Gautier has shown conclusively that oxychloride of copper is a valuable antiseptic with 40 ma. of current (y). I do not doubt the efficacy of the mixed aluminates, though, unfortunately, I have as yet been unable to verify it, and, though I take the routine antiseptic precautions in my office, it is but to "make assurance doubly sure."

However, theoretical speculation and laboratory investigation are of little value unless supported by clinical experience, and I regret that in the past few months, when I have been trying the aluminum in my clinic, I have not had a greater number of cases in which its use was indicated. At present I have only employed it for stenosis with endometritis. One case with a marked dysmenorrhea made a particularly pleasing cure. The few others who are now getting this form of treatment seem to be improving. In conclusion, I believe that in radicl  electrolysis we have a process differing from anything which we have heretofore used; a process particularly adapted to those conditions where the negative pole is indicated and local action on the mucous membrane is desired. The procedure is not to replace or displace anything we now use, but it is designed to add one more specialized method to the armamentarium of the electro-gynecologist.

Appendix.

- a. "Electro-Th. of Gyn.," A. H. Goelet, vol. i. pp. 39-40.
- b. Gautier calls it *electrolyse m dicamenteuse*.
- c. Goelet, vol. i. p. 39.
- d. A. D. Rockwell, *Med. News*, January 25, 1890.
- e. F. Peterson, "International System of El.-Th.," p. 1.
- f. A. D. Rockwell, "System of Pract. Th., Hare," vol. i. p. 212.
- g. *Idem*.
- h. Bartholows, *Med. Elect.*, Phila., 1881, pp. 93-94.

i. This condition is also found in the static, though this is denied by some, and contrary to general belief, chemical decomposition can easily be demonstrated between the poles of a static machine.

j. Goelet, vol. i. p. 42.

k. A. W. Duff, "Bigelow's System," A. 41; Gautier, "Technique d'Electro-Th.," p. 138; also S. Thompson, "Elements," paragraph 418.

l. Thompson, paragraph 211, i.

m. Clinical lecture at the West Side German Dispensary, A. H. Goelet. This has also been demonstrated in the laboratory; Martin, "Elect. Dis. of Women and Obst.," p. 116.

n. "Chronic Metritis," G. Apostoli, appendix 15.

o. *Idem*, p. 18.

p. *Idem*, p. 18.

q. Gautier, p. 139.

r. M. Cleaves, *Revue Internationale d'Electro-Th.*, April, 1894.

s. "Qualitative Analysis," Fresenius, paragraph 100, note.

t.

Aluminum.		Copper.	
50 ma. 10 min.....	0.13		0.50725
Negative.....	0.128	Positive.....	0.4975
	0.002		0.00975
10 ma. 50 min.....	0.146		0.5225
Negative.....	0.1325	Positive.....	0.50725
	0.0135		0.01525

u. Fresenius, paragraph 100.

v. L. W. McKay, D. Sc., Prof. of Chem., Univ. of New Jersey, Princeton.

w. Morton.

x. Gautier, p. 153; Brivois, pp. 142-143

y. Gautier, p. 228; see also Cleaves, April, 1894, in the *Revue Internationale*.

ELECTRIC INDUCTION CABINET.

BY J. H. WOODWARD, M. D., SEWARD, NEB.

This cabinet is a new invention, simple in construction, and yet it is so electrically arranged in its elementary parts that it is equal in curative potency to any similar invention that is known to the medical profession. Those who have been treated by it pronounce its vitalizing effects to be simply magical, and were impressed with wonderment at the efficacy of it, as an electric device for the application of nature's curative force, in restoring them to health when all other means had failed. Scientists tell us that there are only two basic forces in the body acting simultaneously, which keep in physiological tact the endosmose and exosmose processes of building up and waste. The cabinet, by its therapeutic-dynamic force over the centrifugal and centripetal areas of the body, holds in equipoise their functional power, that the body may be nourished and its waste and effete substances passed out. It is more essential that this waste matter be passed out of the body than that food be taken into it. The electric cabinet increases the power of the enervated centrifugal force, which enables it to convey away poisonous material from the blood and tissues. This revitalizing of the centrifugal area of the body with positive electricity, as it moves from the nerve centers to the peripheries, breaks the dam or focusing of the blood by the centripetal force in the congested internal organs, and the blood is sent to the skin and underlying tissues to fill their capillaries, which opens the mouths of the sudoriferous tubes and induces free perspiration in a few minutes, which, by the law of electric atomic attraction and repulsion, repels the *materies morbi* from the blood that cause the various diseases, which are conducted from the patient in the form of atoms by the electrified perspiration and vapor that fill the cabinet, and the poison is attracted

and deposited on the negative metal lining of the cabinet that has been charged by induction. This process equalizes the circulation, stimulates the nervous system, strengthens the heart, increases the action of the kidneys, and the patient begins to convalesce.

This cabinet, when used intelligently and in the forming stage of diphtheria, la grippe, pneumonia, bronchitis, rheumatism, neuralgia, or sciatica, etc., with other proper medication, will check or so modify the malignancy that the death rate will be lessened seventy-five per cent. A full description here cannot be given of this wonderful machine. I say wonderful, because to my knowledge there is no other electric induction machine in America that will absolutely remove disease-germinating poison from the body in the form of atoms by the electric law of atomic attraction and repulsion.

REPORT OF CLINICAL CASES.

BY M. BONNER FLINN, M. D., WORCESTER, MASS.

These cases were treated by me in the last three years. All the cases were pronounced incurable by some of the best medical talent of Worcester.

I believe that if we would use the faradic current more frequently in this class of cases the result would be more satisfactory than the galvanic current.

I feel the need of some standard measurement for the faradic current, so as to give the exact strength used in a given case. I hope we shall be able to meet this want in the near future.

Mr. R. J. P., age forty-five, height six feet, normal weight 145 pounds, farmer. Appetite good, bowels regular, urinating from sixteen to twenty ounces daily; specific gravity 000.25. Has had frequent attacks of inflammatory rheumatism during the past twenty years; valvular disease of the heart; anasarca extending up to ribs; measured twenty-two inches below the knees. His attending physician had pronounced the case fatal in a few weeks. I found the above symptoms, with temperature 99°, weight 168 pounds. Commenced treatment June 16, 1893, and used a faradic current of moderate strength on alternate days, negative to second lumbar vertebra, positive (labile) over the entire abdomen. No improvement the first week. After fifth treatment passed thirty-four ounces of urine. Seventh treatment, ninety-six ounces; specific gravity 000.20. Ninth treatment passed four quarts three ounces in twenty-four hours; anasarca decreasing, heart improving, and able to ride out five miles. From the twelfth to the twentieth visit passed daily forty-five ounces; weight 124½ pounds. At the end of six weeks stopped electricity and gave

R Calomel.....	grs.ii
Ipeca., pulv.....	grs.iix
Digitalis, pulv.....	grs.iixx
Scilla rad., pulv.....	grs.ix
Potassi nit.....	grs.ix
M. Fiant capsulæ No. xx. Sig. 1 capsule t. i. d.	

At this date, September 6, 1894, he is a comparatively well man, driving his team and attending to his farm work.

Mr. C. S. B., age sixty, carpenter; normal weight, 240 pounds. He had whooping cough at ten years of age. Since then has been thought very large for his age—always bloated. He was on the police force for several years, but, on account of his fleshiness, resigned. I was called to see him February 11, 1894, on account of the death of his attending physician.

Diagnosis.—Fatty heart, chronic Bright's disease, general dropsy; weight, 325 pounds. Was compelled to sit in his chair to sleep, and could only walk a few steps. Could take but a few spoonfuls of liquid food at short intervals.

I used an intense faradic current, one electrode on each side of the bowels ten minutes; reversed the current for ten minutes. Then placed one electrode over each kidney for five minutes. Treated daily. At the fourth call had lost twenty pounds. Could now sleep lying down for two or three hours.

On February 22, had a constriction of bowels from umbilical hernia. Severe pains in left side on dejection. Emesis severe. Threw off twenty pints of fluid in twenty-four hours.

February 27.—All conditions improved and taking Mellin's food and beef extracts.

March 2 to 30.—Gave six treatments. Negative electrode on lumbar vertebræ and positive labile over the heart and bowels (current very light) for thirty minutes.

March 30.—Weighs 210 pounds, and gaining in all points. Goes outdoors for exercise.

April 17.—Could walk half a mile.

May 1.—All treatment stopped, as he could attend to his business.

September 3.—Weighs 219 pounds, and in better health than he had been for several years.

Medicine.—Gave merc. dulc. 1x every four hours for constipation (he had been taking one ounce of salts daily, with poor results) for two months. Digitalis 3x every six hours for three months.

Mr. F. D., wire-worker, age fifty-five, came under my care October 5, 1891. He had been under medical care for several months previous.

Symptoms.—General anasarca, valvular disease of the heart, hypertrophy of liver, with chronic Bright's disease. Measurement of the chest, fifty-two inches; of the abdomen, sixty-five inches; calf of the leg, thirty inches. Unable to walk or assist himself. Consultation held A. M. on the above date. Prognosis—Death in a few days.

I applied an intense faradic current from a coil of two thousand feet of No. 36 wire. Placed negative over the eighth dorsal vertebra and the positive labile over the entire abdomen for thirty minutes.

October 6.—Respiration freer. Passed three quarts of urine. Repeated daily treatments for one week, with steady increase of flow of urine till five quarts per diem. General improvements in all symptoms. The cyanosis was gone. Could sleep by resting head on back of a chair. At end of twenty days he was able to walk about the room. Amount of urine, two quarts per diem.

I then placed negative on the right side of abdomen and positive on the left, and passed the current through the bowels ten minutes, reversing the current every three minutes, moving the poles up and down the sides; then for twenty minutes treated as before. At end of six weeks

he could lie down and sleep several hours in bed. Appetite improving. Dropsy gone. At end of ten weeks, weight, 180 pounds, and discharged him cured.

He died from la grippe and pneumonia six weeks later.

During the treatment I gave him merc. dulc. 3x every six hours, with aconite, china, and bryonia as called for by the symptoms.

NEW PAINLESS METHOD OF REMOVING
FACIAL BLEMISHES BY ELEC-
TROLYSIS.

BY H. E. WAITE, M. D., NEW YORK CITY.

Instead of a formal paper, Dr. Waite presented several diagrams showing a new method of connecting the apparatus so that the method could be made painless. He said: "I have found that where cocaine was employed in the usual way in connection with the removal of hairs, it often results in the formation of troublesome ulcers. The use of cocaine is entirely obviated by this new method of passing the faradic current at the same time as the galvanic current.

"I also show you a picture illustrating what I consider to be a most excellent result in the treatment of goitre by electricity. The patient was treated daily, or almost daily, for from ten to twenty minutes at each sitting for a period of one and a half years. The bulging of the eyes did not entirely disappear until about three years after."

Discussion.

DR. FLORA A. BREWSTER of Boston: I have used this method in three cases. In one case the eyes bulged more than even those shown in the photograph just presented. The patient was a Jewess, about twenty-six years of age, who was prone to suddenly fall in the street or anywhere. I continued the treatment for a period of nine months, and up to that time she had been very decidedly improved. She then discontinued treatment. In another case, the treatment was begun early last spring, and at the time of her going away for the summer she was decidedly improved. I have never been able to follow the cases sufficiently long to effect a complete cure, but the improvement has been very gratifying.

DR. YOUNGMAN: I am very glad to hear of the suggestion of combining both currents in the manner described. It is a fre-

quent practice with me in treating strictures of the urethra, rectum, or esophagus, if the galvanic current causes pain, as it often does in the uterus, to disconnect the galvanic battery and apply a mild faradic current. This very quickly relieves the pain. The pain to which I refer is often produced in uterine cases even with a mild current. I am prepared to think, therefore, that this new suggestion will prove to be a very valuable one.

DR. GARDNER : I have had quite a number of cases of goitre. If they are fibrous I can generally reduce them, but not so with the cystic variety. I have at present a case under treatment in which the measurement of the throat was at the beginning of treatment eighteen and a half inches. There was a cystic goitre immediately in front, and a fibrous goitre on the right side. The clay pad has reduced the fibrous growth very materially under the application of the galvanic current of one hundred milliamperes applied for five minutes at a time. I use an eight-inch pad between the shoulders and a clay electrode to the tumor. In the treatment of the cystic form I first draw out the fluid as far as possible, and then inject a hot ten per cent. solution of common salt ; then introduce the needle and pass a current of one hundred milliamperes for five minutes ; then withdraw the salt solution. Under this treatment the cystic growth has been reduced in size about one-third. I must admit that the treatment is not quite satisfactory. When I used the positive pole the swelling and inflammation were very marked for several days after the application, but when the negative pole was used, the reaction entirely subsided within forty-eight hours. After the fourth or fifth treatment there was so much improvement that the patient was able to lie down on a pillow, which before she had been unable to do.

DR. H. E. WAITE : The use of the positive pole with the salt solution resulted in the evolution of chlorine gas, and this probably explains the violent reaction which the speaker observed. A solution of iodide of potassium would have been better than the salt solution.

DR. YOUNGMAN : I have obtained better results with the solution of iodide of lithium (five grains to the ounce) than with the iodide of potassium solution, using the positive pole.

DR. GARDNER : I use a cataphoric electrode of enormous sur-

face so that I could employ a powerful current without producing burns. It has given me good results.

DR. JACKSON : I would like to remark here that Gautier has found much better results from using the copper electrode positive in cystic goitres and in chronic abscesses.

THE PRESIDENT : I have treated many cases of cystic tumor by electricity, and I have never yet had one satisfactory result. I have treated very large unilocular ovarian cysts, and in forty-eight hours there would be a great increase in the quantity of urine and the tumor would disappear entirely, but it would invariably fill up, and when this occurred the discomfort was worse than before because the cyst would be a little larger than before. It was for this reason that I tried the iron needle. By accident I treated a hydrocele with the positive pole, and this case got well ; it was the only one that did get well. I afterward tried needles made of brass and other substances. Sometimes the results would seem to be fair, but at times the cyst would become filled with pus. I tried filling the cysts with iodine, and treating them by positive puncture without drawing the fluid afterward. This always caused considerable inflammation, but it did not prevent the refilling of the cyst. As I have said, I have never seen but the one accidental case already mentioned in which the cyst did not refill, and generally to a greater degree than before treatment.

DR. H. E. WAITE : I know of a remarkable case occurring in the practice of Dr. Joseph Dickson of Pittsburg. The patient was a priest who had an enormous hydro-thorax and also had ascites and a hernia. Positive puncture was made into the cavity on two occasions at an interval of three days, using a trocar-pointed needle, and a current of one hundred milliampères. The hydro-thorax entirely disappeared. The abdominal wall was then punctured and treated in the same manner, and the ascites also disappeared. The patient lived in comparative health and comfort for a year or two after this treatment.

ELECTRICITY IN THE TREATMENT OF LATERAL CURVATURE OF THE SPINE.

BY W. F. ROBINSON, M. D., ALBANY, N. Y.

About a year and a half ago the writer was asked if he could do anything with electricity for spine disease in a child. He replied that he had never tried and did not think he could.

The child was brought to the office, however, where an examination revealed the presence of a left lateral curvature in the dorsal region, the maximum deviation from the median line being an inch and a quarter.

As this affection is claimed to be due entirely to the muscles, the thought occurred to the writer, that, if the muscles that were weakest could be found out and strengthened by means of the current, the deviation might be remedied. He told the mother, therefore, that if she so desired he would see what he could accomplish. Applications of the galvanic current to the muscles, on the concave side of the curve, were then begun, and kept up four or five times a week, for a period of three months and two weeks.

From ten to twenty milliampères were used and the current was applied for ten minutes each time. Just sixty treatments were given in all.

At the end of this time the curve in the spine had entirely disappeared, and the column was as straight as ever.

This being his first case of the kind the writer must confess that he was surprised as well as pleased at the result, the more so, as he was not quite clear in his mind just how it had been obtained. This question involves the whole theory of the etiology of lateral curvature, which it will be necessary to consider at some length.

One theory to account for this deformity is that of unequal bony growth, that is to say, that the lateral halves of the vertebræ on one side are larger and more

developed, owing to some peculiar condition of the embryo, than the corresponding parts on the opposite side.

The result of this would be that the vertebræ would assume a form more or less like a wedge, and the column as a whole would tend to bend over to the less developed side. This theory is considered untenable by almost everyone except those who proposed it. There are no facts to substantiate it, and furthermore if it were true the curve in the spine would be permanent, whereas it can most always be made to disappear during recumbency. Another theory is that lateral curvature is due to rickets.

When cases occur in rachitic children, this disease is undoubtedly the cause of the curvature, but there is no reason whatever to consider this a cause in the cases where curvature occurs in children whose osseous development shows no abnormality.

Still another theory of the cause of lateral curvature is that it is due to inequality in the length of the lower extremities.

This matter of asymmetry in the human body has been very thoroughly investigated by Dr. T. G. Morton of Philadelphia, who has made a great number of measurements, and to whom we owe a most ingenious apparatus for measuring quickly and accurately the difference in length of the lower extremities.

Dr. Morton found that in a very large proportion of the cases examined there was asymmetry of the lower extremities, and by means of his apparatus for measuring them he was able to show in a very striking way the relation of this condition to the spine.

The patient stands with each foot resting upon a block of wood, which, by means of proper apparatus, can be raised up several inches if desired. The clothing is removed, so that a full view of the posterior aspect of the body from head to foot can be obtained.

If the patient have one leg longer than the other, it will

be noticed that the spine will curve toward the side of the shorter leg, and that the cleft of the nates will form an oblique prolongation of the line of the spine.

If now the block upon which the shorter leg rests be gradually raised by an assistant, these lines will straighten and a point will finally be reached where the spine and the cleft of the nates will form a single line, straight and vertical, as they should be in the normal body.

It might seem at first sight that in this experiment lay the key of the whole matter, and that the cause of lateral curvature need not be sought for any further. In other words, the affection is caused by a tilting of the pelvis dependent upon inequality in the length of the legs. Further investigation shows, however, that this conclusion is not as well founded as it seems to be.

If a patient affected with the form of asymmetry described above be examined in a sitting posture, it will be found that the spinal deviation has disappeared, for the reason that the pelvis, having a level base of support, is itself level.

As stated above, asymmetry of the limbs is extremely common, and if it was the cause of lateral curvature this affection should also be frequent, whereas it is comparatively rare.

Furthermore, there are many cases of lateral curvature in which the lower limbs are perfectly equal in length. The only inference to be drawn is that asymmetry of the lower limbs plays a very subordinate part in the etiology of lateral curvature.

Assuming that the conclusions of the writer concerning these theories are true, and that they do not account for lateral curvature, we must look still further in our search for the true one.

It may be of service just here to examine the peculiar conditions of the spinal and dorsal regions. The first important fact to note is that the spine is the only support which the upper part of the body has. Structures that are

intended to support heavy weights are generally rigid, like columns; but the spine, on the other hand, is extremely flexible and bends readily in all directions. Columns of support are always placed upon bases as firm and strong as possible, but the spine rests upon the pelvis, which, instead of being firm and rigid, is constantly being tipped and tilted in every possible way by the various motions of the limbs, which in their turn support it. We find, then, for the spine, some very peculiar conditions—a column whose office it is, singly and alone, to support a heavy superincumbent weight, but which has neither rigidity in itself nor any sort of firm support. Does it not seem as if such a column must fail to do its work under these extraordinary conditions and let its load sink unsupported to the ground? It is evident that this would inevitably be the case if there were not some other support for the column, and this necessary additional aid is beautifully supplied by the wonderful muscular system of the spine and back!

These muscles are numerous and complicated, and may be divided into three groups, for our better consideration of them.

First may be mentioned that group of muscles of which the erector spinæ is the principal member; indeed, it is practically the group itself.

Without going into the anatomical details of its origin and insertion, it is sufficient for our subject to say that it takes its rise from the sacrum and crest of the ilium, and is inserted into the transverse and articular processes of the vertebræ in the dorsal and lumbar regions.

In other words, it goes from the pelvis, which is the base of our column, to the column itself. It acts, therefore, as a stay or support, and may be very fairly compared to the stays which run from a ship's side to the mast.

The second group consists of the psoas magnus muscles and psoas parvus when present.

These muscles arise from the antero-lateral aspects of the

lumbar vertebræ on each side and are inserted into the femora and pelvis, their principal function being to flex the thigh upon the pelvis. Their course is almost directly downward, and in the writer's opinion they can have little or no action in bending the spine to either side, owing to the immense mechanical disadvantage at which they act.

Dr. Lee of Philadelphia claims that these muscles do have an important action in bending the spine, especially when irritated by a congested state of the pelvic organs at the time of the menstrual epoch, and he puts this forward as a reason for the fact that lateral curvature is so much more common in girls than in boys.

In the writer's opinion, this theory has little or nothing to recommend it. If it were so, then a direct relation could be traced between menstrual disturbances and lateral curvature; but with all the careful and painstaking study that has been given to this subject for years no such relationship has ever been found.

If any one will take a cadaver and try, by making traction on the different muscles, to bend the spine, he will be convinced that the psoas magnus muscles have very little to do with it.

The two groups of muscles just considered—the one behind and the other in front of the spine—are alike in this, that they both act at great mechanical disadvantage, owing to the fact that the direction of their pull is almost directly downward. The vertebræ being flat disks set one upon another, the downward pull of these muscles would tend strongly to press the spine together and make it firmer, rather than to flex it to either side.

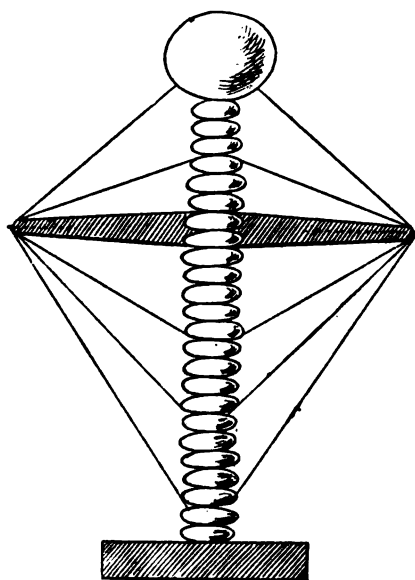
With the muscles of the third group it is just the opposite.

It includes the latissimus dorsi, the rhomboideus major and minor, and the trapezius, muscles that take their origin from the spine and then pass out to either side to assist in moving the upper extremity. In general, it may be said

that the pull of these muscles is very nearly at right angles to the spine, so that they act at the best mechanical advantage.

Dr. Lee claims that these muscles cannot have an action in flexing the spine for the reason that they have no support from the ground, and their only action can be to pull the arm toward the spine.

Although this seems true at first, it can be shown to be a very subtle fallacy. In order to show the possible action



of the muscles of the upper extremity in moving the spine, the author constructed the model which is shown in the accompanying figure.

The upright column which represents the spine is a very slender delicate wire, upon which are strung ordinary glass beads to represent the vertebræ. The cords that run from different points of the column stand for the fibers of the latissimus dorsi and trapezius muscles.

The column supports a crosspiece, at either end of which there is a ring through which these cords all run.

If traction be made upon all the cords or upon any two opposing cords, the column is not affected, and we may assume that this is what occurs in the normal human body—the antagonistic muscles all pulling equally and the result being perfect muscular equilibrium.

If, however, traction be made upon one or more cords, on one side only, the little column of beads is very readily bowed out on that side.

Crude and imperfect as this little model is, it illustrates in a general way exactly what occurs in the human body. It is to these muscles of the third group, and more especially to the latissimus dorsi, that we must look for the cause of curves in the lower part of the spine, and to the trapezius, when they occur in the upper regions.

This brings us to a fourth and probably the correct theory of the lateral curvature; that it is due to unequal muscular equilibrium. This is undoubtedly the main cause of the affection, but it is highly probable that faulty positions of the body and pelvis, whether due to asymmetry or not, may materially help the main cause in its action.

It may, however, be laid down as a rule that a patient with well-developed back muscles will never have lateral curvature, no matter how much asymmetry may be present, unless some special cause has allowed one of these powerful muscles to preponderate over its antagonist of the opposite side.

Lateral curvature is generally seen in young children and is far more frequent in girls than in boys. Moreover, the children of the rich are more apt to be affected than others.

These facts are to be explained by the principle that a powerful predisposing cause of lateral curvature is muscular weakness.

This affection generally comes on between the sixth and tenth years, a period in which the spine is excessively flexible, and the muscular system feeble and undeveloped.

Take, for example, a weak, sickly girl of ten or eleven years old. She does not care much for romping and playing in the open air, but prefers to sit in the house and read. If she has begun to learn the piano, then she spends an hour or two a day sitting upon a stool without a back and practicing exercises.

This last is one of the worst things that she can do, and under such conditions it is not to be wondered at if a curvature develops: it is only strange that any child escapes. Piano playing is specially bad for the following reasons: The back is entirely unsupported, so that the whole task of supporting the body comes upon the weak and feeble muscles.

They soon grow tired and begin to ache, so that the child, in order to rest them, takes one of the vicious attitudes, throwing the body forward and to one side or the other, for, by so doing some of the ligaments are put upon the stretch and a certain proportion of the weight is removed from the tired muscles.

If now the child form the habit of always taking the same position for resting, either the left or the right, then a curvature in the lumbar region is almost sure to develop, corresponding to the side toward which the body generally inclines.

This probably occurs as follows:

The frequent deviation of the spine to the same side tends to give the muscles of that side more advantage, so that the tendency is gradually to overcome the pull of their antagonists upon the opposite side, and increase the curve.

On the other hand, the greater the deviation of the spine from the median line, the more the muscles on the concave side become stretched and weakened, and thus they offer a constantly lessening resistance to the pull of the muscles that are increasing the deformity.

It is easy to see how a very slight deviation of the spine in a young and growing child may rapidly grow worse on account of this perverted muscular action, until serious de-

formity results, and the unfortunate sufferer is compelled to go through life with one shoulder higher than the other, and one half of the chest sunk and flattened while the other bulges out in a most unsightly manner. Bad as this is in the case of a boy, it is far worse when the patient is a girl, for when she grows to maidenhood and appears in party dress, the deformity is of course specially noticeable and mortifying.

Treatment.—The first and most important indication is to straighten the spine, and then to keep it straight.

The best way to do this would seem to be some sort of an appliance such as a brace, and these are warmly recommended by certain physicians.

There are, however, many objections to this mode of treatment, the most important being that it is impossible to confine the tender tissues of a child in a rigid steel structure of any kind without seriously interfering with the growth of the body in its most active stage.

As said before, one of the principal predisposing causes of lateral curvature is muscular weakness.

Any artificial support to a part must necessarily weaken the muscles whose duty it performs.

Does it not follow as a logical conclusion from these premises that a brace, although it may hold up the spine while it is worn, may in the end do a good deal of harm?

Furthermore, the brace not only weakens the muscles whose place it supplies, but it sometimes has a most pernicious action in producing general muscular weakness, and as is claimed by some, a predisposition to pulmonary troubles. Admitting then that the brace is not by any means an ideal form of treatment, what then is to be done? If the curvative is due to the unequal pull of the muscles supporting the spine, then the indication is to strengthen the weaker muscles until they are fully able to antagonize those of the opposite side.

If this can be done in time before the curvative is too

pronounced or any bony change has occurred, then the trouble can be relieved.

The agent which, above all others, is suited for the performance of this important work is electricity. Its value in these cases is due to its wonderful power, when properly used, to stimulate the growth and nutrition of weakened muscles.

No one who has not had a practical experience in its use can form an idea what this power is.

Muscles that have entirely lost their contractility may have it restored to them by this agent.

Muscles that have become to much enfeebled to move the limbs will often be restored to full function in a remarkably short space of time.

It is this power that we make use of in the treatment of lateral curvature. Finding out, as near as possible, the muscles that are at fault, we apply electricity to them in such a way as to increase their strength as rapidly as possible.

The muscles that are pulling the spine out of place are left severely alone. In the treatment of these cases the preference should be given to galvanism, because it not only exercises the muscles in the ordinary way, by stimulating them to contract, but it also has a profound action on the nutrition. There are cases, however, where faradism seems to do as well, or even better.

The question as to which current it is best to use in all cases to obtain a certain result is not by any means a simple one, and a full discussion of it would be such a lengthy matter as to forbid its admission here.

Although galvanism is theoretically the best, it is necessary to have a pretty strong dose of it to obtain the required action. Sometimes this dose is not well borne by a child, and it may be necessary to use faradism in its place.

In certain cases there seems to be no fault of nutrition, and all the muscles need is exercise, as they are only weak from the lack of it.

In these cases the result may be obtained even quicker by faradism than by galvanism.

The reason of this may lie in the fact that the contractions produced by faradism last longer than the other, and therefore give the muscle more exercise.

The method of application is simply to follow the theory laid down in the early part of this paper.

Find out the muscles which are at fault, and, by persistent stimulation, strengthen them until they are capable of doing their share in holding up the spine. Thus, if there is a curve to the left in the lumbar region, we assume that the latissimus dorsi on the right side needs strengthening. If a compensatory curve has already developed in the dorsal region then the trapezius muscle on the left side should be stimulated.

The motor points of these muscles have been carefully determined by the writer, and will be found marked on the accompanying figure.

The trapezius has two motor points, each located about one inch from the median line. The upper point is seen in the figure at the point where the back runs into the neck. The lower one will be found just opposite the spine of the scapula when the arm is allowed to hang down by the side.

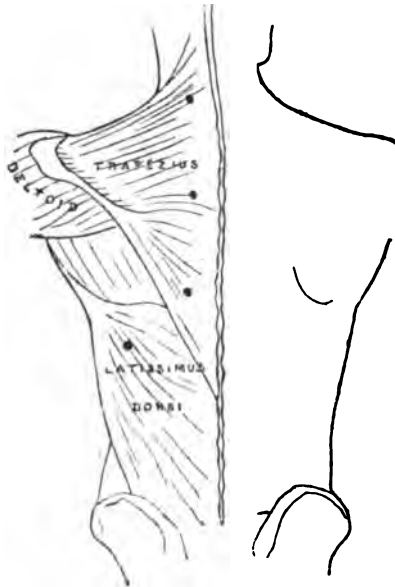
It should be noted that in the figure the arm is carried outward, which tilts up the spine, so that the relationship between it and the point are disturbed. In the living subject, with the arm at the side, the spine of the scapula is nearly horizontal, and remembering that the point is about one inch from the median line, there will be no difficulty in finding it.

There is a third point, a trifle further from the median line than the two just mentioned and about opposite the lower angle of the scapula. Electrical applications at this point cause well marked muscular contractions, but the writer is not prepared to affirm that they occur in the trapezius muscle. It is possible that they occur in the infraspinatus, which lies just beneath the trapezius at this

point, or even the *teres major*. In any case, since these muscles all belong to the system which connects the spine to the upper extremity, their stimulation will serve to assist in bringing about the desired result.

The motor point of the *latissimus dorsi* will be found about two inches below the lower angle of the scapula and three inches from the median line.

It must be borne in mind, however, that motor points cannot be fixed with absolute exactness, as they may differ



slightly in different persons, and a physician must convince himself, therefore, by careful observation in each particular case, that he is reaching the points of maximum contraction.

When galvanism is used, it is of value to apply it, not simply to the motor point, but to the whole extent of the muscle we wish to stimulate, the reason being that the nutrition of the muscle as a whole is thereby increased.

In treating of this subject all authorities agree as to the

importance of properly directed exercises. It is just for this reason that electricity is so valuable, since it is not only a powerful exerciser of the muscles, but it has the great advantage of picking out any desired muscle, or group of muscles, while the rest are left untouched.

Assuming that electricity is the best form of treatment, is it desirable to attempt to reinforce its action by the aid of exercises to strengthen the muscles that are specially weak? In the writer's opinion it is hardly worth while, for several reasons. It is extremely difficult to get a child to carry out special exercises properly, unless there is someone who may be depended on to stand over her and see that she does it.

Furthermore, special exercises are hardly necessary on account of the peculiar powers possessed by the agent we are using—that is, electricity. In cases where five or six treatments a week can be given, special exercises may be dispensed with. It is, however, extremely important that the child should have regular exercise in the open air, such as walking or horseback riding. Tennis playing, while a splendid exercise for those who can stand it, is very violent exertion, and apt to be indulged in to excess.

Regular gymnastics, under the supervision of a competent teacher, are also most excellent, and should also be taken advantage of when possible.

Finally, the child's habits should be carefully inquired into, and if it has formed the habit of taking improper positions, either at the desk or piano, every effort should be made to correct them.

Indeed, it is often an excellent plan to stop the piano lessons entirely for the time being, and direct that the hour be devoted to exercise or recreation.

The reports of the following cases and their results will serve to illustrate what has been said :

CASE I. This case was briefly referred to in the opening of this paper. The child is seen at rare intervals by the author, and there has been no return of the curvature.

CASE II. M. F., girl æt. nine. Patient pale and rather poorly nourished. Fond of reading and did not care for playing out much.

An examination of the back showed that the muscles were very attenuated and feeble. There was present a long dorsal curve to the right, involving also the upper lumbar vertebræ.

If a cord were suspended from the cervical vertebræ the point of maximum curvature was seen to be an inch and a quarter from the median line.

The muscles in the upper part of the back on the left hand side, were thoroughly stimulated for ten minutes at a time by means of the galvanic current, from ten to fifteen ma. being used. The treatments were given every week-day, unless the weather was too stormy for the child to come out. The parents were impressed with the importance of giving the child more fresh air.

It was discovered that the child had a favorite corner where she used to sit and read, leaning always to the right against the cushion. With the help of the parents she was persuaded to give up this seat and take another in which the most comfortable position was leaning to the left. After this child had received forty-six treatments with the galvanic current, the spine seemed on examination to be almost perfectly straight. It being now the latter part of June, the little one was sent into the country, where she was kept the whole summer. On her return an examination of the spine showed it to be entirely normal. The general condition of the patient was also very much improved by her stay in the country. This last is an important point, for if you can tone up a patient to a condition of good general health the chance of curing lateral curvature is very much improved.

After his experience with these two cases, the writer felt quite confident in his power to cure this affection, but the third case which came into his hands was destined to show him his error.

CASE III. A. J., æt. thirteen, male. Severe double curvature of nearly a year's standing with all the usual symptoms, elevation of one shoulder, distortion of the thorax, and severe neuralgic pain the back. A steel brace had been worn continuously for over three months, but little or no benefit had resulted. The treatment was commenced with many misgivings, and after being faithfully carried out for two months, was abandoned. The neuralgic pains were somewhat relieved and the muscles of the back were made stronger, but the curvature and its accompanying distortion were just about the same.

In this case there was no doubt as to the fact that bony change had occurred in the vertebræ. It was therefore futile to hope for a restoration of the deformed spine by any known method.

CASE IV. C. T., æt. eleven, girl. Right lumbar curve, involving also the lower dorsal vertebræ. Maximum deviation one inch. The muscles of the back soft and flabby. Patient showed quite an aptitude for music, and both her parents and her teacher encouraged her to practice as much as possible. The result was that she would spend two or three hours every day at the piano, sitting upon the ordinary piano stool without a back. The writer urged that the music be given up for the time, but this was refused by the parents. It was arranged, however, that she should never practice more than one hour a day, in two periods of half an hour each. The ordinary piano-stool was discarded and a regular chair with a back was substituted for it. As it was in the middle of winter a sled was procured for her, and she was sent out as often as possible to slide down hill. As this patient did not bear galvanism well, the faradic current was used, and the latissimus dorsi on the left side was faithfully stimulated every day. A milder stimulation was also given to the right trapezius muscle, although the compensating curve in the dorsal region was hardly to be made out as yet, probably owing to the fact that the affection was only just beginning. In any case, it yielded very readily to the measures employed, and after thirty-five electrical treatments had been given, the curve was entirely obliterated.

CASE V. O. L., a girl not quite thirteen years old. Curvature to the left in lumbar and lower dorsal regions. Maximum curvature an inch and a quarter. This case was remarkable from the fact that the back was full and well formed, and the muscles well developed.

Measurement of the lower extremities showed the left leg to be one-third of an inch shorter than the right. Patient was also left-handed. The muscles on the left side of the spine stood out round and full, while those on the right were somewhat flattened, and did not offer the same resistance when grasped by the hand. This patient had been examined by a celebrated New York specialist, who declared that she must be immediately put in a brace, or the trouble would get very much worse. This the parents were extremely unwilling to do, as they feared that the child's growth might be impeded thereby. They therefore brought her to me to know if anything could be done by means of electricity.

The latissimus dorsi and the whole muscular mass in the right lumbar and lower dorsal region was thoroughly stimulated by a galvanic current of fifteen ma. every day for ten minutes. After thirty such treatments had been given, the curve had entirely disappeared. This case certainly yielded quite readily to the treatment, the number of treatments being somewhat less than in the other cases.

This was due perhaps to the fact that the muscles of the back were so strong and well developed, and therefore responded all the more readily to the electrical stimulus.

A factor of great importance in hastening the result was that the child was fond of being out doors, and the time being summer, she spent a large portion of the day in the open air.

These cases may seem too few in number to prove the theories advanced in this article, and yet the writer feels that he is justified in publishing them. If they are errors he will be glad to know it before he goes any further.

If they do contain some hints which may prove of value in the treatment of spinal curvature, then he will be more than satisfied in the feeling that his labor has not been entirely in vain.

Although there is nothing very original in the treatment of weakened muscles by electricity, the writer has been unable to find any cases reported where lateral curvature was treated in this way.

EDITORIAL.

SOME PHASES OF IMPROVEMENT.

In looking over a number of old electrical appliances and batteries which I have collected for the past fifteen years,—some I once used and some have been collected for curiosity's sake,—I was struck by the great change which had come over their construction. I say construction, for with one or two exceptions there is no new principle involved. These old batteries may be divided into two classes; first, those which were good for nothing, and second, those which were worse than useless. It is easy for one to look back at the mistakes and fallacies of past generations and, with a patronizing air, pity their ignorance, but so rapid has been the change that I am forced to shudder when I think that I actually used many of these instruments of torture and was enthusiastic in their praise; such experience makes one almost lose confidence in himself as well as in things in general. Is it not fair to suppose that in fifteen years more we will look back at our present status with very much the same feelings as we now look at those of fifteen years ago? If we deny this we must deny progression. Of the first class, those which were good for nothing, may be mentioned the old pocket batteries, especially the pocket galvanic batteries, the one cell galvanic battery used for electrolysis, and the old electric belts of the Pulvermacher type, which were used largely by physicians at one time. Of the second class stands first the old galvanic batteries which lacked facilities to regulate the current strength, and were so unsteady in their action that they changed in intensity almost from minute to minute,

of which fact we were ignorant, owing to the lack of a milliampèremeter. The old form of a magneto-electric battery, which was either strong enough to twist the patient all out of shape, or was not strong enough to be felt at all, was undoubtedly the most vicious instrument of any. The faradic batteries, the coils of which were wound irrespective of the length or size of wire, and with a vibrator which changed from the key of E to G and back again every other second, perhaps, stood next in the category to the old magneto-electric. Yet, who will not say that the older electro-therapeutists did not have success; did they not discover most of the laws of electro-physiology and lay the foundation of the whole subject, and with these very crude and, to us, unsatisfactory instruments? Now, are we, with all our improved apparatus, making as great advancement in electro-physiology and electro-therapy? Of the former it is safe to say we are not, but of the latter it is just as safe to say that we are surpassing them. Is it because the subject of electro-physiology has been exhausted that we have not kept pace with our former workers? Not so, but it is due to the age in which we live. This is above all a practical age in medicine, or in other words, it is a therapeutic age. Never has there been a period in medicine in which there have been made such radical changes in therapeutics, and so many of them, as in recent years. The same tendency is prevalent in electro-therapeutics and the principal advancement made has been along that line. The time will again come when physiological research will return, and I venture to assert that electro-physiology will not be lacking, and with the improvement in our facilities for such experiments, we will undoubtedly surpass all former researches of like nature.

BOOK REVIEWS.

HYPNOTISM, HOW IT IS DONE ; ITS USES AND DANGERS. By
JAS. R. COCKE, M. D.

This is a very interesting little book, published by the Arena Co., and intended as much for the laity as for the physician. In Part I, many examples of hypnotic procedure are given with the therapeutic application. In Part II is found the discussion of (1) Mesmerism, with its hypothetic medium ; (2), the hysterical school of Charcot ; (3), The suggestive school of Bernheim, and (4), the author's explanation, which postulates a latent hysteria, supposed to exist in a greater or less degree in everyone. This is unnecessary, as the theory of the Nancy School (3) explains everything in hypnotism proper. It is to be regretted that the author did not emphasize the fact that being capable of hypnotization is not synonymous with possessing a "weak mind."

EPITOMES.

SOME OBSERVATIONS ON THE USE OF STATIC
ELECTRICITY IN THE TREATMENT OF CHOREA
MINOR.

BY DANIEL R. BROWER, M. D., CHICAGO.

Dr. Brower, in the *North American Practitioner*, from a study of eighty-eight cases of Lydenham's chorea or chorea minor, which were under his treatment during the past five years, by means of the static battery, makes the following observations : The therapeutic effects of the two poles are identical. The patient is insulated with the direct current for about ten minutes, then the static breeze is applied by means of the induced current. The patient was now required to sit quietly in the reception-room for about ten minutes before she left for home. Treatments were repeated every day for the first week, three times the second

week, and two séances a week until the case was relieved. In addition, the best hygienic conditions were called for, attendance at school stopped, an hour's rest in a darkened room at midday, the diet regulated, and the bowels, kidneys, and skin kept in proper condition. Arsenic in some form and in varying amount was given to all and pushed to its physiological limit in some rebellious cases. Bland's mass was given where hemoglobin was below the normal. Fifty-three of these cases were females and the ages ranged from six to thirty years. The average treatment was two weeks less than the minimum under ordinary methods. Forty-five per cent. of all the cases were relieved in about six weeks.

ARTIFICIAL PREGNANCY.

The editor of the *Medical Brief*, in answer to a correspondent who asked for help in a case of supposed sterility, advises the use of electricity, one electrode on the sacrum, and the other in the cervix [This is rather indefinite—B.]. Begin with a mild current and gradually increase its strength. The applications are to be made twice a week, and each to be followed by a tampon saturated with boroglyceride. A hot douche should be taken before retiring each night, and it should be composed of a saturated solution of sodium-bicarbonate.

EXOPHTHALMIC GOITER.

Dr. E. A. R. Newman, Jaudola Fort, Punjaub, through the London *Lancet*, says that the constant current is now successfully used in the treatment of exophthalmic goitre. A weak current should be locally applied.

CAUTERY FOR FURUNCLE.

Dr. Loewenberg, in the *Bull. Médical*, recommends the use of a fine platinum point, 1 cm. long and not over 1 mm. in diameter, in connection with the galvano-cautery. When the furuncle is recognized in its incipency (by a light area surrounding a hair follicle and especially sensitive to the touch) the point is brought to a white heat and thrust deep enough to reach the bottom of the hair follicle, and it should be left in position an instant before withdrawal.

ELECTRICITY IN MIGRAINE.

BY HUGH HAGAN, M. D., ATLANTA, GA.

Dr. Hagan tells us, in the *Medical and Surgical Reporter*, that Erb recommends the galvanic in preference to the faradic current in migraine. Dr. Hagan's mode of application is first to moisten the electrodes with an alkaline solution, then he places one electrode [the anode or the cathode?—B.] on the forehead and the other on the nape of the neck, when the current can be gradually turned on—from two to five ma.—always stopping before the sensation of dizziness is produced. After the current has passed for from three to four minutes it is gradually turned off and the electrodes reapplied over the mastoids, and the séance should not be continued longer than ten minutes, as a general thing.

The doctor explains the use of the faradic current in migraine. The sponge electrodes, the faradic hand, and the wire-brush electrode are used, although he says he never uses the latter, as it is too severe. The application is made the same way as with the galvanic current, except that the strength of current is regulated by the sensation of the patient. Decided pain should never be produced.

HYDRO-ELECTRIC TREATMENT OF HEART DISEASE.

From the *American Practitioner and News* we learn that Professor Marey has attained some results by means of hydro-electric treatment in cardiac affections. Where the heart is not degenerated the treatment can be undertaken; also, where there is no cardiac cachexia.

THE TREATMENT OF CHRONIC ULCERS BY THE ELECTRO-STATIC BRUSH DISCHARGE.

In the *Times and Register* of February 2 is given the experience of Dr. Marquant (*Arch. d'Electr. Med.*) in twenty-two cases of chronic ulcer treated by the brush. He says that the treatment greatly assists the healing of the ulcers. Treatments were given twice a week. The active pole was the anode.

GALVANO-FARADIZATION OF CICATRICES.

According to Dr. R. Lewandowski, physician to the military hospital of Baden, near Vienna, cicatrices—especially such as result from extensive wounds and are of a fiery red tint, which renders them extremely disagreeable in appearance—may be made to rapidly fade, become supple, and loose their adhesions, by the simultaneous application of a constant and an induced current (galvano-faradization).

For this purpose, Dr. Lewandowski makes use of large, well-moistened electrodes, one of which, the indifferent electrode, with a surface of two hundred square centimeters, is applied to the sacral region and connected with the positive pole of a galvanic battery. The negative pole of the battery is connected with the positive pole of the induction coil, the negative pole of which is in connection with the active electrode, which is circular and presents a surface of one hundred square centimeters. The apparatus is provided with a commutator, so arranged that either the galvanic or faradic current may be brought into action separately, or both currents simultaneously.

The strength of the currents used varies according to the sensitiveness of the subject generally and in the region of the cicatrix. On the average it should be from three to five milliampères for the constant current, while the induction current should be just strong enough to determine perceptible contractions in the muscles innervated by the radial nerve.

The active electrode is moved from forty to sixty times over the cicatrix, especially the red parts, and, if it has contracted adhesions, this is to be followed by about one hundred electro-faradic strokes in various directions. Each sitting lasts for fifteen minutes or half an hour. Passive movements are then executed with the limbs, which are immobilized by retraction of the cicatrix, recourse being had, if need be, to electric stimulation of the muscles. Lastly, when necessary, massage and electrization of the atrophied muscles and their nerves are resorted to.

This treatment has been employed successfully by Dr. Lewandowski in about thirty cases of extensive cicatrices. The result was the disappearance, in from thirty to sixty sittings, of the

cicatricial adhesions and contractions, as well as of the disturbances of mobility resulting therefrom. An officer, for example, who, as a result of an extensive burn caused by an explosion of powder, presented on the side of the thorax large cicatrices which prevented his raising the arm, and interfered also with the movements of adduction and abduction of the arm, was subjected to this treatment, with the result that the cicatrices, which were of a fiery red color, faded completely after the second sitting, and soon became soft, losing their glossy aspect. After three weeks of this treatment the mobility of the arm was completely restored.

ELECTRICITY IN AMENORRHOEA.

Dr. Panecki, in the *Therap. Monatsch.*, says the *Medical Times*, lets the profession know that the faradic current is the most successful means of treating amenorrhœa. The poles should be allowed to act inside the uterus. The current can be increased at each sitting, and the treatments required, ranging from five to fifteen minutes, are all the way from five to thirty. The doctor had treated eighteen cases and cured them all. One was a married woman, æt. thirty-one, who had never menstruated, though she had periodical headache, etc.

—A French doctor, according to the Cincinnati *Medical Journal*, has devised a vibrating helmet, constructed of strips of steel, and the motive power is a small electric motor. Its inventor uses it in case of nervous headache. "The sensation, which is described as not unpleasant, produces drowsiness, the patient falls to sleep under its influence, and awakes to find that the pain has ceased."

—A recent London *Lancet* has interesting allusions to the "successful use of electricity in trigeminal neuralgia and to long-continued treatment of tic douloureux (which is practically the same thing), with long and short applications of the current. Success is uniform in all cases."

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ORIGINAL ARTICLES.

FARADIC ELECTRICITY IN INFLAMMATION.*

BY O. L. WILLIAMS, M. D., DALLAS, TEX.

In presenting this paper for your consideration I am not unmindful of the professional prejudice that has given birth to a determined and relentless warfare against electricity from its inception.

Unscientific deductions, due to a want of systematic investigation, account for this merciless crusade.

All innovations in medicine, from the days of Jenner, have had to pass through the same crucible of professional criticism. There can be no objection to this; on the contrary, it is, and has always been, a safeguard against the theories of ultra-extremists and enthusiasts.

While this is true, a certain measure of enthusiasm is necessary to inspire the truth-seeker with the proper degree of application, energy, and persistency necessary for investigation, intelligent deduction, the development of new theories, and their elaboration into facts.

The superficial thinker, the casual observer, the spasmodic investigator will never rise above the average pro-

* Read before the Texas State Medical Association, April 24, 1895.

fessional mind in efforts to grasp progressive ideas, conceived and elaborated by minds disciplined to thoughtful study and patient research. My observation of the physiological effects and the indications and contra-indications for the employment of faradic electricity through a decade of years entitle my conclusions to some little consideration.

In presenting these conclusions I am prompted only by a fraternal desire to remove prejudice, awaken interest, and encourage research in the interest of a neglected therapeutic agent, stigmatized and condemned because found in the hands of quacks and charlatans. This tirade cannot much longer prevail when such men as Apostoli of France, the Keaths of London, Rockwell, Morton, Goelet, and Mundi of New York; Martin of Chicago, Massey of Philadelphia, Englemann of St. Louis, and others, many of whom occupy prominent positions as teachers in the great medical centers, whose professional characters are above reproach, whose literary productions are accepted as textbooks to guide the general practitioner, and whose voices have been heard in defense and commendation of this much-abused therapeutic agent.

When I shall have finished reading this paper, embodying my observations and conclusions, however crudely expressed, it will be, as far as I am aware, the first paper read in this country favoring the use of faradic electricity in acute inflammation. Believing as I do that the time is not far remote when it will rank with, if not surpass, our most highly esteemed therapeutic agents for controlling inflammation, I esteem it a privilege and honor of which I justly feel proud. I would be unfair and unjust if I failed to state that my esteemed friend and former partner, Dr. W. T. Baird of this city, who was my preceptor in electricity, has long been familiar with the results of faradic electricity in acute inflammation, having demonstrated to my satisfaction years ago its benign influence when thus used. But he has never given publicity to his conclusions, leaving

that pleasant duty to your humble speaker. It is not my purpose to give a history of faradic electricity from its inception three score years ago, and trace it through its tragic fluctuations in professional esteem. It is a matter of record and can be found in any of the text-books on electricity. I shall try and confine myself to the practical part of the subject.

To make myself better understood, it will be necessary to refer briefly to the pathology of inflammation.

It is a subject that has always been one of deep interest to the medical profession. Until in recent years, when the histological changes which ensue in the animal organism from the presence and action of specific micro-organisms was advanced, there were no well-defined ideas as to what its pathology was.

I have not the time, even if I possessed the ability, to enter into a full discussion of its pathology; hence, I shall only discuss some of its most prominent factors to better exemplify how faradic electricity may be utilized to arrest, and discuss the inflammatory process. The one factor that concerns us most is arterial, venous, and capillary dilatation. Of the three, the capillary disturbances are the most prominent and the most serious. The dilatation in the arteries of smaller caliber is first observed. Soon the veins become involved and lastly the capillaries. So rapid is the morbid process that often in a few hours the lumen of these vascular channels are double their normal size. Capillaries ordinarily scarcely recognizable, containing little if any blood, soon become visible, adding turgidity and redness to the inflamed area. So long as there is a continuous, uninterrupted flow in the channels, the corpuscles flow on in their respective currents, the white and colored corpuscles are carried along the stronger central stream and a few find their way into the more sluggish, peripheral side current bearing the leucocytes and third corpuscles. The circulation now becomes more obstructed

until congestion is established. Soon intra-vascular changes occur. There is a slowing of the capillary stream and with it an aggregation of the corpuscular elements; then the leucocytes are separated from the central to the more sluggish peripheral current, where they aggregate into heaps and masses, impeding still more the current flow. With diminished flow comes also separation of blood corpuscles, favoring obstruction already commenced in the peripheral channel by the leucocytes. Soon they become attached to the wall of the vessel and by continuous aggregation reduce the lumen of the channel until complete stagnation ensues.

Just here I wish to emphasize an observation of Paget's, that blood in stagnated vessels has little tendency to coagulation; hence, the possibility of *resistitutio ad interim* of the circulation after subsidence of the acute symptoms. Another fact I wish to enforce is that stagnation first occurs and is most pronounced in the tortuous capillaries, where of necessity the current is most sluggish. Senn says: "Alteration of capillary wall has been repeatedly enumerated as the most important feature of inflammation, and without such change the rapid escape of leucocytes, as we find it in inflammation, would be utterly impossible."

The cause which has produced the inflammation produces such an amount of softening in the cement substance as to permit its penetration by the leucocytes between the endothelial cells, or, as some of the authors claim, localized minute defects cause the formation of minute openings through which the leucocytes escape.

Pain in many forms of inflammation is also a prominent factor. To traction and pressure of the sensitive nerve filaments must we look for its solution. Unless suppressed it will cause an increased determination of blood to the inflamed area, without in any way encouraging the collateral circulation, thus increasing blood pressure, favoring capillary rupture, exudation, transudation, and leucocytic

migration. To pursue this pathological investigation further would transcend the limit allowed by this association of such papers. Therefore I shall omit much that is interesting, and endeavor to exemplify how faradic electricity meets the pathological conditions of inflammation.

In the first place, we claim that this form of electricity, acting through the vaso-motor nerves, contracts the arterioles, limits dilatation, and prevents distention, and in so doing the secondary effects, such as transudation, exudation, and vascular changes, are proportionately prevented.

In the second place, possibly through its vibratory mechanical action, the blood current through the vascular channels is urged onward, the peripheral and axial zones of the current being alike promoted, thereby preventing accumulation and aggregation of the leucocytes. An unimpeded blood current also interposes a barrier to the fixation of the leucocytes to the capillary wall, opposing their aggregation, and in the same degree preventing one of the causes of obstruction of the blood stream. This force naturally expends itself on the larger channels, but through its deep interpolar action reaches the remote arterioles and, secondarily, the delicate capillaries, whose marked tortuosity favors stagnation. There, we have shown, the most disastrous circulatory disturbances occur.

It does not stop here, but its effects on the collateral circulation are very decided and pronounced, thus diverting the blood to other channels than those leading to the inflamed zone. This deep inter-polar action, reaching far beyond the range of topical applications, such as poultices, fomentations, and blisters, gives to this agent a range of applications inestimable and far reaching. The decided effects of this current in keeping open the blood channels cannot be too much emphasized. In so doing, transudation into the extra-vascular tissues is limited, and as this extra-vascular pressure is a prominent factor in favoring obstruction of the circulation through the capillaries by

compression, it meets one of the most prominent indications in the inflammatory process. Not only so, but as pain is largely due to pressure from these exudates on the nerve filaments, whatever will limit transudation will proportionately prevent pain.

Another equally potent fact can be deduced from an arrest of these exudates. They are loaded with microbes, hence the more rapid and extensive the process of exudation the more rapid and diffusive the systemic infection. But its usefulness does not stop with the congestive stage; when stasis is established, when the axial area of the inflamed zone is being rapidly devitalized and cut off from the vitalizing blood, faradic electricity in the same physiological manner, by establishing a vigorous collateral circulation, by preventing obstruction in the affected capillaries from the aggregation of the leucocytes and by keeping open the blood channels, prevents over-distention, which we have shown impairs the integrity of the delicate capillary walls, hastens vascular changes, and prediposes to capillary rupture.

Proportionately, transudation, exudation, and extra-vascular accumulation into the surrounding lymph and connective tissues spaces is prevented. Nor is this all it does; it preserves intact the circulation up to and around the inflamed zone whereby highly vitalized blood, loaded with oxidizable elements, is kept constantly injected into the disintegrating structures, interposing a barrier to its extension.

Senn has truthfully said that "An unimpaired *vis a tergo* is one of the best means to prevent stasis within the inflamed capillaries, and practical experience has shown that all remedies and agents that diminish the intra-arterial tension only diminish the prospect of a favorable termination."

There is another phase of the faradic current worthy of mention, viz., its distribution of the phagocytes to the

seat of inflammatory warfare through a well-preserved circulation. The absorption of aseptic tissues in the human organism by certain cells is believed and defended by some of our ablest pathologists. Through these phagocytes dead tissue is removed and the micro-organisms destroyed. The leucocytes are accorded a prominent place in this group of scavengers. But to remain operative the circulation must be preserved. When stasis occurs they are cut off and their benign influence is lost in the stagnated zone. The faradic current, by keeping open the blood channels, prepares the way for constantly re-enforcing this army of systemic microbe destroyers, limiting infection. It also favorably influences the temperature. Some stigmatize this as a strange and delusive conclusion. Gentlemen, if the physiological effect of faradic electricity, as outlined by me, fails to do this, my entire theory is fallacious.

It would be unreasonable, after studying the pathology of inflammation, to anticipate any such marked reduction in the temperature during the height of the inflammatory process with so many disturbing factors at work, as can be secured from aconite and coal tar products. On the one hand we have faradic electricity gradually but slowly arresting and removing the inflammatory process, and with it all systematic manifestations. On the other hand, we have a class of agents truly superficial, whose great power, in my opinion, is heat elimination.

The great exponent of American surgery, Senn, has truthfully said of these antipyretics that "they accomplish their work at the expense of the processes which are laboring to clear obstructed paths, and on this account their use has resulted in more harm than good to the patient." But, you ask, how can faradic electricity modify temperature? I answer, inasmuch as elevation of temperature in inflammation is the result of the entrance into the blood of micro-organisms, or their products in the form of ptomaines, whatever prevents their multiplication and

lessens their products must of necessity lower the symptomatic fever. This, we have endeavored to show, faradic electricity will do. Not by any direct chemical action through the blood, although some claim for it this power, but through its indirect physiological effects.

But faradic electricity does not stop with an arrest of the inflammatory process. The same physiological effects exert their potent influence in re-establishing the normal circulation in the affected capillaries, promoting absorption and favoring rapid granulation, the latter erecting, as it were, an impermeable wall around the suppurating or sloughing cavity, whereby both processes are arrested. It does more than this; during the height of the inflammatory action, when the sensory nerves are crying out against traction and pressure to which their delicate filaments are subjected, the soothing and quieting effect of the faradic current is unquestionable. This is, in my opinion, accomplished by removing the products of exudation and transudation, and with them the pressure of the nerve filaments which is the cause of pain.

A forcible demonstration of this is found in cases of suppurative steno-myolitis or periostitis, where pain is rapidly dissipated by operative procedures, permitting an escape of the encapsulated inflammatory products.

I have thus briefly sketched the pathology of inflammation and the therapeutical effects of faradic electricity.

I have tried to exemplify how it arrests the inflammatory process; how, after arresting it, it may hasten resolution, promote absorption, hasten granulation, and expedite restitution; how it may subdue pain and lower temperature. It is due that great apostle of electricity in gynecology, Apostoli of France, to record, in his own words, the estimate he places on faradic electricity in acute inflammation of the uterus and its appendages. Gentlemen, if this agent will subdue inflammation in the uterus and its appendages, it will act with no less certainty in inflamma-

tion located elsewhere. The pathology is the same wherever localized.

Apostoli says: "The common feeling of the profession certainly is that a palliative treatment is all that can be adopted in this disease."

When called to a woman suffering from perimetritis or phlegmonous inflammation, it is mostly with reluctance and hesitation that anything more is done than to order soothing applications to the abdomen and await results. I protest against this sterile inactivity, which prevents no mischief, does nothing in the way of cure, and leaves the disease to run its own course unopposed.

Although the operative proceedings, which I think necessary, require great caution, I undertake them for two definite objects: (1) to calm down the pain the patient is enduring, and (2) to arrest, if possible, the inflammatory action, and to prevent its running on to suppuration. I faradize every woman, even when under an acute attack of inflammation, observing, however, the following practical rules. These rules are so practical, so concise, so easily understood, and are so much in accord with my own observations, and, with some slight modifications, applicable to all forms of inflammation, that I embody them in this paper:

1. I proscribe every faradization that would cause the least pain and expressly that of quantity engendered by the coil with short thick wire.

2. I use for such cases the coil with long fine wire, from which I obtain a current of tension, on account of its special anodynous effects.

3. I begin with a single vaginal application by means of a bipolar electrode, the point of which is placed against the inflamed part.

4. I only employ a current easily bearable, so as to cause no suffering or any excitement of the patient, as this would insure an entire failure of the treatment.

5. All the success of this medication depends upon making the first sittings sedative, so that they may serve as a prelude to more active measures; and the faradization will only become hyposthenic on the double condition of its low intensity and its long duration.

6. Each sitting should last five, ten, fifteen, twenty, or twenty-five minutes, as may be required, and should not terminate before the patient spontaneously declares she is better and suffers less.

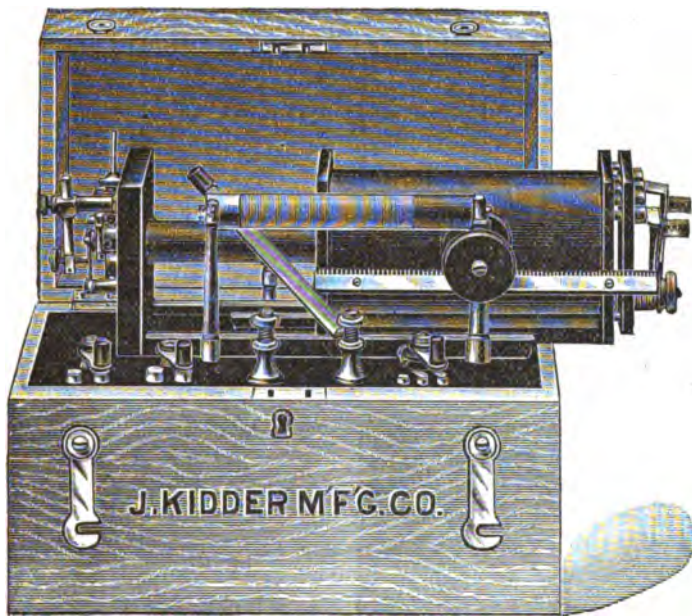
7. It is unnecessary to re-enforce what has been said by dogmatically averring that no success will come out of this treatment unless it be managed not only without violence, but with extreme gentleness.

8. There may be one or two sittings each day, as may be wanted for lowering the febrile action, allaying pain, and bringing about what is called the subacute stage of inflammation.

9. Every faradization should be preceded and followed by a vaginal irrigation with sublimate solution, and all sounds should be scrupulously disinfected.

These rules come to us from a world-renowned electrician, who has done more to place electricity upon a solid basis than any other man living. As to my method, I will say, in all applications to subdue acute inflammation, I prefer the current of tension from the long, fine wire. The machine I use is before you for inspection. It is manufactured by Jerome Kidder Manufacturing Company of New York, and the coil of long, fine wire, No. 36, the smallest that can be used, is 4500 feet in length. While I prefer a current from this coil on account of its more sedative effect, I am not in accord with Apostoli in his sweeping proscription of the primary short heavy coil. Some of the most striking results I have obtained have been secured from the coarse, short, primary coil of the Kidder battery. Whether my success was due to the method employed, I am not prepared to say. In using this coil I have always adopted

the method suggested by Dr. W. T. Baird, which, so far as I am aware, originated with him. It consists in connecting the positive electrode with a short coil, fully one-third shorter than that with which the negative electrode is connected. His theory is that there is a neutral point in the circuit equi-distant from the opposing electrodes, and by lengthening the negative cord this neutral point is located



more remote from the positive electrode and the seat of inflammation, thus guarding the inflamed structures against any negative electricity.*

In using this primary coil the electrodes must be enveloped in flannels wet with a warm solution of table salt to better enable the current, which is one of normal electromotive force, to overcome resistance. In treating inflam-

* This was taught by Clarke in his "New System of Electricity."—Baird.

mation a current such as is suggested by Apostoli, of low intensity, should be used, long continued. I have found it necessary to prolong applications far beyond the time he suggests, and with more frequency. Indeed, I attribute the satisfactory results I have obtained to these prolonged séances. My applications seldom stop short of one hour, unless evidence of fatigue is manifest. And, in one case I can recall, when treating a violently inflamed parotid gland, induced by complete occlusion of the duct, on several occasions the applications continued for three hours. As a rule, I find it necessary to repeat the applications at least one hour in every four.

It is astonishing with what comfort to the patient this treatment will discuss a carbuncle. Recently one of my medical periodicals contained a criticism from a doctor, who said electricians were constantly referring to the internal treatment of the poor uterus, or some other concealed zone where their vague theories are undemonstrable. If I had him here with a carbuncle on his dignified person, I would show him the benign influence of electricity in the light of day.

Where the sensibility is pronounced, a current of low intensity is indispensable. If not otherwise obtainable, such a current can be secured by using large electrodes, reducing their size as the sensibility is subdued. In diffuse peritoneal inflammation, I cover the entire abdominal surface with an electrode made of the ordinary brass-wire gauze used by tinner in making milk strainers. They are cheap, easily improvised, are flexible, and can be made to conform to any irregular or uneven surface. They are equally convenient in treating the limbs, being easily bound to any part.

Where pain is pronounced, a current of more intensity will sometimes act more decidedly, especially if the central and peripheral extremities of the nerves be embraced in the circuit. A reduction in the size of the electrode will

likewise increase the intensity of the current. There should not be too great a disproportion in the size of the opposing electrodes; with a positive electrode covering the abdomen, the negative electrode should not be less than four by ten or twelve inches, or the out-going current will be too irritating. The electrode should be so placed as to run the current through the inflamed zone. In the treatment of smaller lesions the electrode must be made to conform to the inflamed area. The positive electrode must always be placed over or above the seat of inflammation. All the electrodes should be well protected with flannels previously wet with hot water and applied warm. Having applied the electrodes, reduce the current to zero, make the connections and start the battery; then cautiously increase the current, and always stop short of the least discomfort.

The length of this paper forbids my speaking of the effects of the different coils, and the necessity of familiarizing yourselves with the effects of rapid and slow interruptions of the vibrator, a proper conception of which is absolutely necessary in the use of this form of electricity.

I would have been pleased to speak of the class of cases I have found this agent most useful in. Possibly some time in the future it may be my privilege to do so.

CASES FROM PRACTICE.

BY SYDNEY BARRINGTON ELIOT, M. D.

In the writings upon electro-therapeutics, too little attention has been given to clinical detail of cases. It is not elaborations upon physics, nor a lengthy explanation of new or varied uses of electricity, that conveys the best idea of its application to disease, but a presentation of convincing cases, with an exact statement in each of the conditions present, courses pursued, and the results obtained. It is only such positive evidence that is convincing; and if more attention was given to such report of cases, it would be of much benefit.

I submit the following cases, taken somewhat at random from the case book. They are commonly met with, and may be of interest.

There is no class of cases where electricity has a better application, nor where it is more needed, than in those of constipation; and when one considers the readiness with which it is applied, with almost unvarying success, its immunity from pain or unpleasant effects of any kind, when properly used, it is hard to conceive why it is not more generally applied. The two following cases are of interest:

Mr. G. M., age forty-eight, bilious temperament, had been a sufferer from constipation and its accompaniments for twenty-five years. He had tried everything; took enormous doses of purgatives to get a movement, and then only every three or four days, and with difficulty. There seemed to be a paralytic condition of the intestines; there was dilatation and complete atony of the rectum. Hemorrhoids were present, and gave him much trouble. He suffered from severe headaches, was greatly debilitated, and his memory and whole mental condition was much impaired. He was, in fact, a complete physical wreck. He was a constant sufferer from dyspepsia, and could digest only the

simplest baby foods. Galvanism was applied, using at first the negative pole to the spine and positive pole to the abdomen, kneading the abdomen with a sponge electrode. Later the roller (electro-metal covered with chamois) was used, and the abdomen rolled and kneaded with it. Treatment was applied three times a week, at first, for ten minutes at a time, later increasing to twenty, and the current was given as strong as he could bear it, gradually increasing it. After a few treatments with the galvanic, faradism was alternated with it, giving each for ten minutes. This was continued for two months, after which the galvanic was given alone, using one pole over the sacrum (negative) and the other on the perineum and in the rectum (a cylinder). This was followed out for a month, gradually decreasing the current. The patient's condition, by degrees, became perfectly normal. He had normal actions from the bowels, his digestion improved, and his whole condition greatly changed. About a year after there seemed to be a tendency to a return of his trouble, but a few applications completely overcame this, and he has been well ever since.

Miss A. E., age forty, large, well-developed woman, weight 180 pounds, had been a constant sufferer from constipation for ten years. She could not have a movement without resorting to drugs, and long-continued use of enemas had caused a relaxed condition of the rectum. Galvanism was applied at first four times a week, toward the end of the treatment not so often—once or twice a week. The faradic current was alternated with the galvanic, as in the previous case, giving each for ten minutes at first, later for fifteen minutes each, and gradually decreasing. The fine wire was used at first in the faradic, and later the coarse wire. The treatment was continued ten weeks, and her condition gradually became normal. She had a fibroid of the uterus, and when the constipation was relieved this almost entirely disappeared, probably due to the return to normal of the circulation in the pelvic organs,

the bowels getting a normal supply of blood, and consequently that of the tumor being decreased. Her condition was completely cured; she never had a return of it, and this is three years since.

I consider electricity undoubtedly the most available means we have to-day for constipation. It can also be applied to great advantage in prolapsus of the rectum, hemorrhoids, etc. But perhaps its sphere of greatest use is in diseases peculiar to women. Here it is a boon to the female sex, and has an almost unlimited use. The following cases can convey but a small idea of its wide field for application.

Mrs. C. M., age twenty-four, menstruated at thirteen, has always been regular, and the flow lasted five to six days; but, from the first, always suffered extreme pain during menstruation. The flow was preceded four or five days by distressing uterine cramps; she suffered most intensely, and this was followed by a discharge of thick blood. Thorough dilatation of the os accomplished nothing. The pelvic organs were normal. Faradism was applied, sedative current, one electrode in the uterus and one on the abdomen, using the large abdominal pad; began with a small current, gradually increasing. Treatment lasted fifteen minutes, and was given three times a week for three weeks. Her next menstruation was painless and normal in every particular. She was at the office the day before the flow appeared, and there were indications of menstruation; but she would not believe it possible that her menses could come on without pain, as she had always suffered so intensely before, and with every period; and, using no precautions that night before retiring, she awoke the next morning to find herself in rather a sanguinary dilemma. Her succeeding menstruations were equally painless, and she has had no returns of her trouble.

Mrs. H. R., age thirty-one, menstruated at thirteen; she was regular, but always suffered much pain; had never been

pregnant. The uterus was slightly anteflexed, and there was a little endometritis. Galvanism was applied, using aluminium electrode (negative) in the uterus and clay electrode on the abdomen. Fifteen to 60 ma. were given, lasting at first ten minutes, increasing to twenty twice a week, and the whole treatment lasted two months. Her first menstruation after commencing treatment was attended with some pain, but most bearable to what it had been. Subsequently she suffered no pain whatever, and reported the same condition a year after.

Miss J. A., age eighteen, menstruated at fifteen once, but had not had a menstrual discharge up to the time she applied for relief. Each month, as the time for her menses came around, she would have considerable uterine pain, pains in the back, dizziness, and would go to bed for two or three days, but there was no discharge of any kind. The pelvic organs were normal, there was no mechanical obstruction. The os was dilated, but with no result. Galvanism was applied, one pole in the uterus and the other on the abdomen, lasting five to ten minutes, and three or four times a week for three weeks, until her regular time for menstruation came around, when the flow was normal, and has been so since, now six months ago.

Mrs. D. H., age thirty, large, stout woman, prior to the cessation of her menses she had a good figure, but since then had become very fleshy; there was a great accumulation of fat about the abdomen. Her menses had always been scanty, but ceased entirely about two years before she applied for treatment. The uterus was undeveloped, cavity two inches in length. Faradism was applied, moderately coarse wire, abdominal pad, single pole in the vagina, current as strong as she could comfortably bear it, lasting ten to fifteen minutes, three times a week. The menstrual flow was re-established, lasted three or four days, more than she had ever had, and was normal. All the excessive fat was reabsorbed, and her general health was greatly improved.

She had been very much indisposed to exertion of any kind, but now took up her duties with zeal and pleasure.

Mrs. S. G., age thirty-two, no children, very stout, menses irregular and lasting only about one hour and with pain. Applied galvanism, negative pole in the uterus, positive on the abdomen (clay pad), using 30 to 40 ma., lasting ten to fifteen minutes, and extending over a period of two months. Her menses were entirely re-established, and have been normal ever since.

The two following cases are those of menorrhagia and will be briefly given. Mrs. S. A., age thirty-seven, would flow ten days or more over her normal time at each menstruation. Bipolar faradism was applied in vagina, 16-wire five minutes; one treatment entirely stopped it.

Mrs. K. R., aged thirty-eight, flow lasting seven or eight days over her normal time. Intra-uterine bipolar faradism, 16-wire, one treatment of five to ten minutes stopped it in a few hours.

The following case is one of endometritis: Mrs. R. T., age twenty-eight, subinvolution of the uterus from miscarriage. Uterus had been curetted, but no good results. Applied galvanism 20 ma., followed by bipolar faradism 22-wire ten minutes. At first twice a week, then once a week, and later every two weeks. In three months the endometritis had entirely disappeared.

Nor is the application of electricity to the genital organs confined solely to the female. It has a valuable sphere in many troubles of the male, such as sexual debility, strictures, cases of long standing gonorrheal conditions, cystitis, etc. The following case is one of interest and one frequently met with:

Mr. E. S., aged thirty-seven, had entire loss of sexual power. He was debilitated and depressed. Faradism was applied, one electrode on each testicle, then one electrode in the urethra as far as the prostate and on the sacrum, sometimes sponge electrode on the perineum, five minutes

in each locality, medium wire, twice a week for five weeks. Applications of cold water to the genitals were also used. The result was a complete restoration to the normal state, not only sexually, but generally, and a cheerful frame of mind.

Electricity is an excellent application in neuralgias of all kinds. The most severe headaches can often be stopped at once. The three following cases are not infrequently to be met with :

Mrs. A. R., age twenty-six, had been suffering for two days from the most intense neuralgia of the face. She had not slept for two nights, had resorted to morphine, chlorodyne, and cannabis indica. Faradism was applied, sedative current, for fifteen minutes, gradually increasing the strength. Relief was immediate and for the first time in three nights she slept all night. Two days after there was a slight recurrence. When she received a second treatment she had no return of her trouble.

Mrs. B. H., age twenty-nine, for two years had been suffering from ovarian neuralgia. Three months before applying for relief had a miscarriage at three months, and her suffering had become much intensified. She had been treated by several experts, but to no avail. Since her miscarriage she suffered so much she was incapacitated for her duties. Faradism was applied, sedative current, beginning with mild current and gradually increasing, lasting fifteen minutes, one pole in the vagina and one on the abdomen. The result after a few treatments was entire relief. Subsequently there seemed to be a tendency to return of her former condition and she was given a few more treatments. Since then she has had no return whatever and is entirely relieved of her trouble.

Mrs. L. R., age thirty-five, had been suffering from neuralgia of the left arm for nine months, she could sleep but little, and suffered very much. Applied faradism every day for a few days, then every other day for two weeks, five to

ten minutes at a time, one pole up and down the arm and one pole in the nape of the neck. She was entirely cured of her trouble and had no return of it.

Excellent results can be obtained by using electricity in renal colic. Galvanic current, positive pole over the kidney and negative over the bladder. In several cases I have known the results have been almost magical.

It has a useful sphere in removing moles, superfluous hair, cysts, some forms of tumors, and goiters. One case of the latter, I recall, is that of a young woman, medium-sized goiter, galvanic current used, positive over the goiter, negative on the back of the neck, for twenty minutes, three times a week. In seven weeks the goiter entirely disappeared and in three years there has been no return of it.

A few of the many other conditions in which electricity has a useful sphere are uterine displacements, stenosis, indurations, tissue adhesions, ankylosis, œdema; it is excellent here, and it has a distinct field in mental diseases. I should like to submit further cases, but time and space forbid; I hope to do so at a future date.

In conclusion, it is but necessary to say, that in electricity we have a powerful agent with which to combat many forms of disease, and that it is by far too little appreciated.

CASE OF DYSMENORRHEA.

BY BESSIE P. HAINES, M. D., ST. PAUL, MINN.

Miss S., aged seventeen, in appearance slight, and intellect below the average, had been affected with dysmenorrhea ever since maturity, and for five months had resorted to morphine, as every other means of relief had failed. This, no doubt, accounted for her apparent dullness. I applied the positive electrode attached to a No. 1 dilator to the cervix, and the negative electrode to the spine between the scapulæ, the séance lasting thirty minutes. She received three treatments per week, and at the end of the second week the menses appeared without the slightest disturbance. She abandoned the use of morphine after the first treatment and has been perfectly free from dysmenorrhea for nineteen months, and her mental and physical improvement has been remarkable.

Mrs. — for two years had been subject to nervous chills, terminating in spasms and unconsciousness. Her case had been pronounced by several physicians hopeless without an operation, but they never told her the cause of her trouble.

I found the cervix flexed upon the fundus and immovable. I requested her to give me one month's trial, as I believed I could save her the operation she so much dreaded. I applied the positive electrode to the point of inflection anteriorly, and the negative directly opposite. After the third treatment I brought the cervix forward and held it firmly until the tampon was inserted to keep it in place.

After six weeks' treatment she went to the World's Fair, and has been so comfortable that she has not returned for treatment to complete the cure. The only remedy she received was gels. for the first three days.

Miss B., aged twenty-seven, had been treated two years for malaria, receiving no benefit. After getting her history I pronounced her trouble ovarian neuralgia, and applied

electricity, placing the negative electrode over the ovary, and the positive directly opposite on the back. At the end of thirty minutes she was relieved of her pain for the first time in ten days. In three months I discharged my patient as cured.

In all of these cases I used the primary faradic current. In regard to the quality and intensity of the current, I regulate them according to my patient, and always avoid increasing the current to a degree that is unpleasant, and find that the degree of tolerance varies in each patient.

ORIGINAL TRANSLATIONS.

ELECTRICAL TREATMENT OF INTESTINAL OBSTRUCTION.

BY E. DOUMER, M. D.

In the treatment of this affection almost all forms of electricity may be employed, but time should not be lost in using methods of doubtful efficacy. We should have recourse at once to the best and most rapidly acting methods. These are percutaneous galvanization and rectal galvanization.

Percutaneous galvanization is a very simple method.

The two electrodes, well moistened, are placed upon the abdominal walls, and a current of from 15 to 20 ma. sent through them, being interrupted about four times a minute.

Unless there are contra-indications the electrodes are slowly moved about over the surface of the abdomen, especially in the neighborhood of the iliac fossæ.

If a good movement does not follow after two such applications of ten minutes each, given two or three hours apart, then intra-rectal galvanization must be used.

It should be applied according to the method of Dr. de Boudet of Paris.

The intestinal sound of Boudet is introduced deeply into the rectum, and attached to an irrigator filled with a saturated salt solution.

Place upon the abdomen a large, flat electrode, well moistened with salt solution.

Attach the negative pole to the abdominal electrode and the positive pole to the one in the rectum.

Allow the salt solution to flow very gently from the irrigator into the rectum, and when half its contents has been introduced turn on the current and increase it until it

reaches 15 to 40 ma., according to the case. Allow the current to pass for five minutes.

Reduce the current to zero, reverse the poles, and bring up again to its former intensity. The current should now be interrupted every twenty seconds.

Energetic contractions will soon make themselves felt and the patient will feel an urgent desire to go to stool. When this becomes too strong to be resisted the sound is withdrawn and the operation is finished. All that is necessary to complete it is to give one or two saline enemata in the course of the next twenty-four hours.

If the contractions do not appear, continue the interruptions for ten minutes, then withdraw the electrodes. If a movement does not occur in two or three hours a second application may be given and sometimes a third. Contra-indications. Do not use intra-intestinal galvanization:

1. When there is reason to fear intestinal ulceration.
2. In the case of patients who are very much weakened from any causes.
3. In cases where powerful purgatives have been employed for a long time.—*Archives d'Électricité Médicale.*

ELECTRICAL TREATMENT OF THE VOMITING OF PREGNANCY.

BY DR. DE RIBES.

The author reports several cases in which the vomiting of pregnancy, after resisting all other methods, yielded rapidly to descending galvanization of the pneumogastric.

The positive pole should be applied above the clavicle, between the two branches of the sterno-mastoid.

The positive electrode is made of carbon about the size of a silver half dollar and covered so as to avoid burning the skin.

The negative electrode, formed of a plate ten centimeters by eight in dimensions, is placed over the umbilicus.

The treatment should last from a quarter to half an hour, current strength from 8 to 10 ma.

Care must be taken to increase and decrease the current very gently, and especially when opening the current. This is in order to avoid shocks which might cause excitation of the nerve. On this account it is very necessary to have a good rheostat in the circuit.—*Archives d'Électricité Médicale*.

INTESTINAL PARALYSIS IN TYPHOID AND ITS TREATMENT BY THE CONSTANT CURRENT.

BY DRS. FERNET AND MARTIN.

Aggravated tympanites was formerly a common symptom, and was due, in the writer's opinion, largely to the repeated use of purgatives in the treatment of typhoid fever and to improper diet. To-day, thanks to our better methods of treatment, excessive distention of the abdomen is rare, except in certain cases. It may occur from any cause where the patient is very weak or in old cases of dyspepsia.

Under these conditions, especially in the latter case, the distention of the abdomen may become quite a serious matter. The gaseous as well as the liquid contents of the bowels are retained and a condition of paralysis or well-marked paresis is present. The bowels become distended, as in cases of true intestinal obstruction.

In this serious complication remedies have very little action.

The different cathartic remedies, external applications, and abdominal massage, all are either without action or else are more or less dangerous. Something better than all these must be sought for, and this is what Dr. Henry Martin of Passy has done.

His idea is to excite the contractions of the intestines by means of the continuous current.

The method may be illustrated by the following case :

A woman, who kept a pastry-cook shop, was taken with a severe case of typhoid fever. She was treated by means of cold baths, a milk diet, intestinal antiseptics, and stimulants. At the end of a month she was convalescent and doing very nicely, with the exception of certain abdominal symptoms.

At the tenth day of the disease the abdomen became intensely distended. There was neither stool nor emission of gas, and vomiting set in. The face became drawn and the temperature fell from 40° to 38° Cent. It looked very much as if we were in the presence of a beginning peritonitis. In point of fact, however, the trouble was due to intestinal paresis, largely owing to the dyspepsia from which the patient had always suffered. The fall in the temperature was undoubtedly due to a somewhat profuse uterine hemorrhage which had occurred the night before. It was for the relief of this excessive distention and to restore the power to the paretic intestinal walls that the following procedure was tried: One pole of a galvanic battery was placed upon the lumbar region and the other, formed of a ball of cotton, was moved along the course of the large intestine, special attention being given to the region of the cæcum and to the left iliac fossa. The first treatment lasted ten minutes, and about twenty minutes afterward the patient had an evacuation of gas and fecal matter. For six days the electricity was used, sometimes once and sometimes twice a day, until the stools became natural. The strength of the current used was 6 ma.

In this case we may believe that a current of 6 ma. was sufficient to determine intestinal contractions without exerting any harmful influence upon Peyer's patches and to remove the intestinal paralysis, which was becoming very serious.—*Archives d'Électricité Médicale.*

ALTERNATING CURRENTS OF HIGH TENSION IN THERAPEUTICS.

BY DR. SLETOR.

After some general considerations upon the mode of producing alternating currents of high frequency and high tension, the author goes on to mention the names of those who have used these currents in medicine.

He then relates a case where he used this agent with most satisfactory results.

A man, forty-five years old, fell while intoxicated and dislocated the head of the right humerus downward. The luxation was reduced the next day, but the bandage was drawn so tight that the hand became œdematous, and on the seventh day he fainted from the pain. The bandage was changed, but the œdema persisted and the strength of the arm became very much lessened. In spite of energetic treatment by means of massage, faradic and static electricity for nine months, the arm wasted and both motion and sensation were completely lost. There was no reaction either to galvanism or faradism, and the electrical resistance was considerably increased.

The treatment by means of the high tension alternating current was then commenced. After the first day the patient began to feel queer sensations in the neighborhood of the wrist. On the third day he was able to execute some of the movements at the shoulder joint. From this time on the movements returned one by one and three weeks later he regained complete use of the arm, which was also restored to its normal size.

All the nerves except the radial and the muscles reacted to the current. The author lays a good deal of stress upon the rapidity of the improvement in this case, which gives food for reflection in regard to the prognosis of these cases, generally so serious.

Thanks to the efficacy of this new method of treatment,

as shown in this case, these grave prognoses may now be modified for the better.—*Archives d'Électricité Médicale*.

PRACTICAL MONOPLÉGIA FROM LIGHTNING STROKE.

BY DR. J. COLLET.

Cha., farmer, æt. thirty, a dull and illiterate peasant, neither alcoholic or syphilitic and without any trace of nervousness.

Nine days before his entrance into the hospital he was sleeping upon a pile of straw in the open air, when he was awakened by a violent thunderstorm. As he rose from the straw he was struck by a bolt and thrown to the ground. He was paralyzed by the blow so that he could not call for help. He did not think he lost consciousness, and yet he was unable to say how long he remained upon the ground.

He soon regained his ability to speak, but was unable to walk for several minutes. Then his legs regained their strength, but his left arm remained paralyzed.

There was no wound visible as a result of the stroke, nor did he experience any pain afterward.

At the time of his entrance there was present well-marked paresis of the left arm, affecting all the muscles about equally.

There was no apparent atrophy of the affected muscles and no tremor.

The movements of the shoulder itself were perfectly retained.

The patellar reflexes on both sides were slightly exaggerated.

The sensibility to pain was slightly diminished on both sides, possibly a little more so on the left.

There was no inequality in the size of the pupils.

The reaction to the faradic current was the same for both sides.

A careful galvanic examination showed that the normal formula of contraction was present, and there was no sign of the reaction of degeneration.

The paralyzed member was treated by daily applications of faradism.

The patient stayed sixteen days in the hospital, and when he left there remained only a slight degree of paresis of the left arm.

The question now comes up : What was the cause of the paralysis? Was it the lightning or was this one of the numerous cases of traumatic hysteria?

Let us look first at the latter supposition ;

In cases of traumatic hysteria we are almost sure to have, at least, some slight history of the nervous or hysterical temperament.

The paralysis comes on generally, not right after the accident, but there is almost always an interval between the two.

Finally, it may be said that hysterical paralysis never comes on without grave disturbances of the sensibility.

In the present case none of these signs were to be observed.

The patient was a robust peasant without a trace of nervousness, nor was there any history of such in the family.

The paralysis came on instantly, for when he was first found upon the ground, a few minutes after the stroke, the whole left side was completely paralyzed.

Last and most important of all, there was no change of any consequence in the sensibility.

The sensibility to pain was indeed blunted, but it was the same on both sides.

Furthermore, this is a condition which is often found in healthy laborers.

To resume, it seems that in this case the paralysis was due to the lightning alone, and that hysteria played no part in it.

It is not unreasonable to suppose that the shock of the lightning stroke may cause a concussion of the nervous system sufficient to produce the functional or dynamic disturbances which have been observed clinically, just as it may in other cases awaken a neurosis which has been latent up to that time.—*Archives d'Électricité Médicale*.

THE ELECTRICAL TREATMENT OF NERVOUS VOMITING, WITH SPECIAL REFERENCE TO THE INTRACTABLE VOMITING OF PREGNANCY.*

BY G. GAUTIER AND J. LARAT.

Various treatments have been suggested for intractable nervous emesis, and the long list of therapeutic procedures recommended, especially for the vomiting of pregnancy, increases daily; yet, as Pinard says, "nothing can be prescribed to-day except with the idea that it *may* succeed.

We believe that electricity is one of the most powerful remedies, if the method and precautions are followed which we use, and which were described by Semmola in 1878.

Brenner successfully electrified a case of stomachic irritability with pyrosis by placing an electrode on each side of the neck, using the continuous current. Neither the polarity nor the quantity was given.

The method which we think should be followed in these cases was originated by Semmola. Since 1868 he systematically electrified all his cases of intractable nervous emesis, both hospital and private, and considers this treatment so infallible that he uses it for diagnostic purposes.

* From the *Revue Internationale d'Electrothérapie*, April, 1895.

The cessation is, he considers, proof of its being only symptomatic, whether the organic lesion be in the stomach or elsewhere. In support of this theory he has published some very remarkable and constant results (*vide Journal de Thérapeutique de Gubler*, 1879).

De Watteville treats nervous vomiting by placing an electrode of seventy square cm. on the epigastrium; the other, of twenty square cm., on the back of the neck. This latter is held in place for five minutes, and then, for the same length of time, on each side of the neck, over the course of the pneumogastric, and finally is moved up and down on both sides of the trachea. The procedure is then repeated with reversed current.

Onimus and Apostoli used a similar method. The latter placed the + on the neck and the — in the hand. But later, as this method undoubtedly did not give complete satisfaction, he placed both electrodes on the sides of the neck, over the course of the vagus.

Others have used faradization, but their results have not been as constant or as rapid as those of Semmola, and we agree with him in thinking that galvanism, except perhaps in cases of hysterical vomiting, is infinitely preferable.

Those who use electro-therapeutics know the sedative action of stable descending galvanism. This action is shown daily where frequently an ascending current, applied nearer the nervous centers, appears to aggravate a pain which is ameliorated by the descending current. These painful sensations are more plainly demonstrated with the alternating galvanic current; and we therefore reject De Watteville's method. The unfavorable action of the alternating current has been demonstrated by a relapse in one of our patients with intractable vomiting, which, having stopped after the second treatment, recommenced under the ascending current, the + pole being placed upon the epigastrium.

The direction of the current appears to us to play an

important part in the treatment of nervous vomiting, be the physiological explanation what it may.

It is well known that the physiology of the direction of the current in a healthy individual is yet to be discovered, and that the electro-tonic effects observed experimentally in the bared nerve are extremely doubtful in their clinical significance.

The phenomena observed in the two cases are so contradictory that a correct understanding of their significance cannot be formed; so we rely only on clinical observations made before us by many, particularly by Onimus. We therefore recommend the descending galvanic current.

The positive pole should be placed above the clavicle, between the insertions of the sternocleidomastoid. This + electrode should be the size of a two-franc piece. The — electrode, 9 x 13 cm., should be placed at the level of the epigastric fold. A small current, 8–10 ma., is usually sufficient. The current should be exhibited and closed slowly, for fear of shock, by means of a rheostat. Treatments last fifteen to thirty minutes, and should be repeated several times a day in severe cases.

In all of our cases the vomiting had been stopped at the end of forty-eight hours, or, at least, decidedly ameliorated. The number of daily treatments, their duration, and dosage, can be given but approximately. The result, which varies somewhat in individual cases, can only be determined by experience.

In our cases we give only those which have been followed by hospital physicians. Recently we have had the pleasure of successfully attending a case of vomiting in the wife of one of our *confrères*, which had been treated by all the usual methods without result.

CASE I. Mrs. K., primipara; good health; menstruated regularly. Menses stopped January 8, 1895; vomiting commenced February 22. The patient could retain nothing, and vomited forty-five times in twenty-four hours

having violent epigastric pain and frequent fainting attacks. The second week the nights became bad, the pulse filiform. She then became pale and began to lose weight. Finally, an obstinate constipation was added. The vomiting became worse, and the insomnia was complete, with great physical prostration and cerebral excitement. Drugs had no effect.

Professor Dieulefoy advised increased doses of morphine, and, if these proved ineffective, the induction of abortion.

The case had lasted thirty-six days, and there was danger of death from inanition, when Dr. Champetier de Ribes, called in on March 25, advised electricity. The treatment was commenced that evening.

The patient was able to retain half a cup of milk, and felt better. About 3 A. M. she became worse again. The following day at 8.30 A. M. the treatment was repeated with the same results; but the pain, when it returned, was violent.

The third treatment was in the afternoon; the fourth in the evening. A continuous improvement commenced, the nausea becoming less, the pulse better, the constipation disappearing, while on the third day she slept without morphine. These treatments were given thrice daily for three days; then twice for five days. The patient could eat anything. The eighth day the cure appeared complete, but the treatment was continued once daily. On the sixteenth day she had regained her normal condition, and soon left Paris.

CASE II. Intractable vomiting and constipation of seventeen days' standing; continuous and abundant salivation. Mrs. De R., æt. forty; multipara; five sound children; good health; sixth pregnancy in October, 1894. Vomiting appeared following December. The patient could retain no food. All medication was vain. Morphine was given to induce sleep. Lavage was not tolerated. The sixteenth day the doctor (Champetier de Ribes) advised

electricity. The patient at this time was pale and emaciated, complained of great fatigue with vertigo, a nervous erethism and insomnia, and had nausea day and night. She could retain only a little kirschwasser. Vomiting of bile; no stool for seventeen days. December 17, 20 ma. galvanization of vagus for twenty minutes. The resistance was noticeable. This diminished in subsequent sittings. The treatment was well tolerated, and a cup of bouillon retained. There was some nausea during the night and vomiting in the morning.

The morphine was stopped against the wish of the patient. December 18, two treatments, the — being at the level of the umbilicus, the + over the course of the vagus for fifteen minutes, and over the back of the neck for the same length of time. Nourishment, with but one vomiting attack during the night. The constipation was first touched on the nineteenth day after faradism had been given. On December 26 the patient is much better, retains food, bowels move, though a little salivation remains. The sleep is good. Thereafter but one daily treatment, until February 3, when it was stopped entirely, the patient being cured.

CASE III. Mrs. L. M., twenty-three years old; married at twenty-two. In February, 1894, was troubled with vaginismus, which was ameliorated in six treatments with the alternating current. One pole was placed on the sacrum, the other in the vagina.

First pregnancy in March, 1894. Nothing particular for three months. At the end of June, however, the vomiting began, and was obstinate, in spite of lavage and medications. She could retain neither solid nor liquid food.

July 7, descending galvanism to the vagus enabled her to retain a glass of water. On the 8th, after two treatments, a cup of bouillon, the provoking nausea was retained.

On the 10th and 11th, two treatments. Each is stopped

at the end of ten minutes; the patient takes bouillon, and the treatment is resumed for five minutes. The sixteenth day the treatment was discontinued, and the accouchement in December was normal.

In this case a cup of bouillon caused distress for several hours, unless followed by the treatment. This is well illustrated by Case No. VIII.

CASE IV. The patient imagined that the tingling sensation at the electrodes helped her; so she was put on the current of tension. As she did not improve, galvanism was resumed, effecting a cure.

CASE V. Extra-uterine pregnancy. The galvanism controlled the vomiting up to the time of the operation, and assisted in the convalescence.

CASE VI. Patient did not vomit during first pregnancy. In the second, drugs were of no avail, but the condition was relieved in forty-eight hours by galvanism.

CASE VII. In a case of three months' pregnancy the emesis had lasted several weeks, and invariably followed the taking of any food. Vomiting, which could not be helped by the usual methods, was cured by galvanism in four treatments.

CASE VIII. On April 3 a case was seen which was pale, weak, emaciated. A cup of bouillon was vomited five minutes later. After the treatment she was able to retain it; in five days could eat meat, and in seven was completely cured, and remained so.

CASE IX. (Dr. Fourrier). Two months' pregnancy; anorexia, nausea, emaciation, and prostration. Medication vain; the electric treatment rapid and complete.

CASE X. A little girl of eleven had nervous vomiting. Diagnosis uncertain; possibly hysteria, possibly uræmia (there were traces of albumen in the urine). Her condition was somewhat ameliorated, but she finally died.

CASE XI. Mrs. G., æt. thirty; had typhoid when seventeen, but made a good recovery; married a twenty-two;

no children. Three years later she had a painful spot over the left eye and attacks of vomiting, having no apparent relation to her diet. This stopped after an external application of camphor and alcohol, with the exhibition of quinine. A year later the condition returned. The nausea persisted as long as the head pained. Still later she discovered that she was nearly blind in the right eye. An atrophy of the retina was diagnosed. Being treated by the method as above, she gained strength. Finally the other eye was affected; but, notwithstanding an undoubted cerebral lesion, the current controlled the vomiting, and, though nearly blind, she grew stout.

From these observations we draw the following conclusions:

(1) Descending galvanism over the course of the vagus, following the above method (long, small current, with frequent sittings), is a valuable treatment for vomiting.

(2) It is a curative remedy of the greatest value in the vomiting of pregnancy.

(3) In nausea due to grave, or even lethal, lesions of the nerve centers, this treatment either cures symptomatically or ameliorates considerably.

(4) The effect of this treatment is rapid, and it requires no adjuvant.

NOTE ON THE ELECTRIC TREATMENT OF VOMITING.

BY DR. GEORGES APOSTOLI.

Official Bulletin of the French Electro-therapeutic Society, April, 1895.

The galvanic treatment of vomiting has just received a new baptism before the Medical Society of the Parisian Hospitals.

I would have nothing to say to this resurrection, of which

I could not but approve, were it not my duty to show incidentally the lapse of memory of one of the promoters, who seems to forget that, in 1882-3 and 4, he has seen applied daily, at each of my clinics, the same procedure which he extols to-day.

True, he has changed a single, unimportant detail in the technique; but the rest is a perfect reproduction.

The occasion seemed a good one to review this important subject.

Vomiting occupies, as a symptom, a large place in pathology; hysteria and pregnancy offer us typical examples which we can readily observe, and study the respective value of the various medicaments used to control it—methods usually fruitless, and which have to give precedence to the rational and methodical application of the continuous current.

In all works on electro-therapeutics will be found more or less precise indications for the application of electricity in stomachic affections. Although I do not intend to give you the complete history, I cannot refrain from emphasizing the fine work of Professor Semmola, which is so important in this branch, as well as that of my master, A. Tripier, who formulated the galvanic therapeutics of vomiting, which I shall now discuss, in calling your attention to my modifications of the operative technique, which I have introduced into this treatment.

On the 11th of August, 1882, I read before the Medical Society of the Parisian Hospitals a note (based on twenty-eight favorable observations) on the electric treatment of hysterical gastric derangements (emesis, gastralgia) in which I extolled the descending galvanization + pole, of the right pneumogastric with a continuous current, of small quantity and of long duration.

Many previous experiments made at my clinic had demonstrated that the position of the other electrode was absolutely indifferent, therefore, simply on account of its

ease of application, I have used the hand of the opposite side to close the circuit.

Shortly after, I applied the same therapeusis, with equal success, first in the vomiting of pregnancy, and then in a large number of gastric troubles, caused by various pathological stomachic lesions.

Moreover, I have, after a large number of comparative experiments, modified and improved my first operative technique, increasing its remedial action by galvanizing simultaneously the two pneumogastrics—but always with a small dose of long duration.

In August, 1884, I read a second paper, before the International Medical College, at Copenhagen, on the application of electricity to gastric derangements, and there treated at length the vomiting of pregnancy.

Since then, a practice of ten years has demonstrated the value of this technique, which I recommended in 1882 and perfected in 1884. Allow me to explain it to-day, by noting its important points and by substantiating it with my very complete experience.

Whatever the nature of the vomiting, whether it be hysterical or is connected with some gastric derangement, as that of pregnancy, for example, the operative technique is the same and consists of a number of minute details which must be carefully observed, for my practice has shown that, especially in grave and intractable cases, all the success of this method depends on their scrupulous observance.

In my first paper on this subject I have studied successively the nature, place, and time of the applications, their dose, duration, and the number. I wish to explain again the chief points of formulating the rules which are attached to them.

I. NATURE AND PLACE OF THE APPLICATION.—In 1882, I repeat, I adopted exclusively the + galvanization of one of the pneumogastrics, and applied, always successfully, to the right side. Later, some failures and parallel

comparative experiments made me modify my first method, and I suggested the simultaneous galvanization of both vagi. It is this latter method, confirmed and strengthened by long experience, which I now recommend as being the most rapid, the most active, and the easiest to apply.

It consists of placing two small equally sized electrodes at the inner angle of the clavicles, at a point as near as possible to the trunk of the vagus.

As a matter of fact, it is the galvanization of this nerve at its most accessible place, and one which is easily found by the patient. Each electrode is placed about a centimeter from the end of the clavicles, grazing the upper surface of the bone, at the level of the depression which is left between the two beads of the sternocleidomastoid. Each electrode, usually held by the patient, should be small, about the size of a franc, in order to increase the density of the current at this level and to concentrate it *in situ*, that is to say, on the subjacent parts, including the vagus.

The electrode consists of a carbon button covered with gauze, conical or flat, according as a greater or less penetration is desired. It is covered with chamois skin moistened in water, with one or more layers of agaric according to the circumstances.

This last detail is of great importance with those women on whom it is necessary to operate with the minimum of pain and further to avoid scarring, which otherwise is almost invariable, on account of the small size of the electrode and the duration of the séance.

One, two, or three layers of agaric prevents the chemical cauterization and thus avoids a scar which few women would pardon.

The current of the battery should be as steady as possible and all interruptions should be avoided. It is advisable to add a single cell at a time, and still preferable to use a rheostat in order to avoid a shock, either at the beginning or end of the treatment.

II. THE DOSE.—The quantity of the current depends on the tolerance of the patient and the resistance to be overcome. There are two guiding rules: cure the patient; do not needlessly cauterize the skin.

The average dose varies from 5 ma. to 10 ma. but it is necessary occasionally to raise it—usually for an instant—to 15 ma. This is also done gradually and following the indications given by the patient.

The patient should be instructed to watch his sensations and tell the operator—particularly of nausea—that the quantity of current may be properly regulated.

Then by watching the meter and adjusting the current, all the fluctuations may be observed.

If, from the beginning, the current rises steadily to 5 ma. and the patient feels a considerable amelioration, all nausea disappearing, the limit is reached, for it is useless to increase the dose.

If, on the contrary, vomiting is immanent during the treatment itself, it is necessary to increase the quantity, immediately and rapidly, until one of two things occurs; either the patient feels better, or complains of the burning. Then diminish the current, and run it up rapidly to about 5 ma. Then stop and increase it again at each sign of a return of the nausea, prodromal of the next vomiting.

I believe that much of the success of galvanism in vomiting is due to the adaptation of the dose to the gravity of the evil, and certainly the variety is infinite, from simple, unimportant reflex vomiting to the intractible emesis which threatens the life of certain pregnant women.

It is to be remembered that women present a great difference of cutaneous sensibility, especially about the neck, and it is not wise to shock by an overdose which can provoke severe pain.

It is preferable, in the beginning, to keep to a medium dose, to acclimate them in a way, and to allow the moistening of the skin by the electrodes, with its consequent diminution of resistance.

III. THE DURATION.—The duration should be, as the quantity, proportioned to the gravity of the trouble, and, as a general rule, I say, that no sitting should be ended until it produced an effect. It should then be continued until the patient says she is better, and not stopped until all nausea has gone and a normal condition been re-established.

It is therefore impossible to determine, as some of my predecessors have done, the duration of the treatment with mathematical exactness.

It is necessary to continue the application until the patient admittedly feels well, and has no desire to vomit. Further, it is necessary to be prepared to recommence at the first sign of a return for some time after the first treatment.

So from five minutes to an hour, with the time for resting, may be said to be the proper duration of the first treatment.

There is no necessity in the beginning of being discouraged. Only wait. The stomach, accustomed to vomiting, frequently commences by emptying itself. Often it has the characteristics of another attack. It is, therefore, necessary to wait until the patient says spontaneously: "I feel better, I do not think I shall vomit any more."

The average duration varies from ten minutes to twenty, and more, but it must be known that it can and ought to be continued much longer in some rare cases, and in these, care must be taken not to scar the skin.

IV. THE TIME.—Galvanism having rather a curative than prophylactic action, it is better to treat during digestion to combat the dyspepsia, or the vomiting.

So the patient is made to eat, and the current, if applied then, will insure digestion and prevent emesis.

This indication is important, the vomiting should be immanent, and the spasm arrested, that is: the patient being put in a condition favorable for vomiting and the crisis averted, the pathological habitude of the stomach is broken as the pneumogastric irritation is calmed.

This is how I proceed :

First Time.—I make a preparatory treatment with a small current, for two or three minutes, the stomach being empty.

Second Time.—Without interrupting the seance, I make the patient eat little by little, or drink that which is said to be the most apt to cause vomiting. I thus precede the difficulty by overcoming it step by step from the beginning.

Third Time.—I continue the current for a variable length of time after the ingestion of food or drink.

V. NUMBER OF TREATMENTS.—The treatments should be frequent at first, and in the beginning all digestion should be helped by the galvanism. Later, as amelioration is observed, the intervals are lengthened. Here, again, the variable personal element enters, and the method depends on the condition of the patient.

A single application may cure a case of intractable vomiting, though more frequently a second and a third will be found necessary.

The convalescent stomach often has a relapse, and it is wise to help it fulfill its function by several treatments, in order to prevent this.

Usually two treatments are given each day—one in the morning and one at night—particularly if the first was not a complete success, and a relapse should not be allowed.

In 1882, from eight cases, four of them intractable, I told how none had not vomited during the first treatment, how some again in the evening and the next day, and that from one to eight treatments sufficed to effect a cure.

Later experience confirms this, and, especially in pregnancy, a relapse is equally well treated in the same way. To recapitulate, this is a uniform treatment which I systematized in 1882, and which I have used exclusively, and always successfully, hundreds of times for vomiting.

It consists of descending galvanism, or + pole, applied to the right, or, better, to both pneumogastrics, with vari-

able dose and duration, and stops almost at once the derangement, be it epigastralgia, gastralgia, or vomiting, in such a way as to leave beyond question the action on the vagus and its pathogenetic importance.

I would add that this proceeding has no effect on sub-mammary, umbilical, or ovarian neuralgias, and that its action seems limited to the gastric region.

Have I, then, caused some sort of a diathesis? No. The galvanism, given as above, stops a symptom; that is all. If a relapse occurs, it will stop it again.

Thus, by preventing the manifestation of a symptom—pain or spasm—a normal process is substituted for a morbid habit.

Finally, the continuous galvanic current, properly given, is the treatment for the symptom, whether it be dyspepsia, gastralgia, or vomiting. If the symptom is purely reflex, as, for example, the vomiting of pregnancy, the action is immediate and supreme. In other non-carcinomatous cases it is extremely valuable as an active adjuvant to the classical therapeutics.

EDITORIAL.

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THE STABILITY OF ELECTRO-THERAPEUTICS.

There are a few of the old conservative physicians, more particularly surgeons, who still claim that electro-therapeutics has, as yet, no legitimate place in the medical profession; that it has no foundation to stand upon, and what is claimed for it will not bear the test of time. This has been the cry of a certain class among the profession for the last fifteen years, to our certain knowledge, and we have no doubt that it reaches much further back. The most gratifying feature is that this class of physicians is rapidly growing less.

Well do we remember when Dr. Apostoli's treatment was first written about—how the surgeons scorned it to ridicule, as they thought, and how they predicted that, in one year's time, it would not be heard of; and when, after the lapse of two years, it was still maintaining an ascendancy, two prominent surgeons declared, in one of the leading medical journals of this country, that all that kept it alive was the practice of its disciples' visiting Paris, renewing their faith, and returning home to invigorate those who were growing weak. Beautifully were the journeys of eminent physicians, from various parts of America to Paris, to study at Apos-

toli's clinic, compared with a devout Mohammedan's visit to the shrine of Mecca, to do homage to his god and renew his faith, bringing back miraculous tales to encourage and strengthen the less faithful at home.

Well, now, about ten years have elapsed, and instead of Apostoli's treatment being remembered as one of those passing myths which is so common in medicine, it is surely a reality with us to-day. It is no longer in the experimental stage, but is in a stage of development pleasing to contemplate. Those little changes which have been made here and there, at which the enemy would point his finger with glee and cry, "You see, the wall is crumbling!" are simply those changes which have come about from a healthy development, the result of careful research and thoughtful consideration; and instead of the wall crumbling, it is being re-enforced with solid blocks of granite.

But let us look even farther back than Apostoli. The truths developed by Brenner are truths still, and will ever continue to be. The clinical uses of electricity which were put forward years ago by Remak and Duchene are growing day by day in popularity. Central galvanization and general faradization, announced by Beard and Rockwell nearly thirty years ago, are being studied and applied more than ever before.

Now, let us glance at other therapeutic means and see how some of them have withstood the test of time. During the period we have covered with electro-therapeutics, many operations tending to mutilate the human body have arisen and flourished for a time, occupying a very large space in medical literature and practice, and have died a natural death.

It has been even worse in medicine. Take, for instance, the Brown-Séquard elixir, Koch's lymph, and the various serums—all have come and gone; yet the men who upheld those various therapeutic fallacies were the very ones who were most bitter in decrying electro-therapeutics.

It is natural that it should be so. The man who denies the law and order of civil government, the growth of hundreds of years of civilization, will be an anarchist, and the person who denies the truths of Christianity, which has withstood the test of ages and of the best scholarship, will be a believer in hobgoblins and ghosts.

Our duty is plain to continue to work for improvement and to fortify the weak spots in our armor, for the more we fortify the fewer enemies will we have. In fact, they are growing less so rapidly one would hardly believe we have any left, were it not for the fact that one occasionally appears, but subsides again without doing any damage.

BOOK REVIEWS.

A STANDARD DICTIONARY OF THE ENGLISH LANGUAGE, vol. ii.
Funk & Wagnalls, New York.

The routine work of book reviewing may become monotonous at times, but when such a massive and scholarly work as the one under consideration is placed before the reviewer, it breaks the monotony. We gave a description of the general outline of the work when reviewing the first volume, which was printed on p. 121, vol. xii, but as there have been many additions to the subscription list of this journal since we will reprint the first paragraph of that review.

"In opening the book, the first thing that strikes the observer as being out of the ordinary course of dictionary work, is the

lack of capitalization of the words defined. Instead of each beginning with a capital, as in most dictionaries, proper nouns only are capitalized. Another point of difference from the older dictionaries is that the words are run in, as it were, being given along in sentences, and often various combinations being defined together. This is done to save space, and is also found to be very convenient. The words are as easily found as if each was brought back to the beginning of the line, as the large, black-faced type which they are printed in easily distinguishes them. It is this arrangement which enables the editors to get in a larger number of words than any other dictionary, and yet not occupy as much space as some of them. The spelling is the most marked change of any from ordinary usage. It is very much simplified along the line of phonetic spelling."

In looking over the completed work and examining the various changes and improvements, the reviewer is embarrassed by the large amount of material at his command, for he would need many pages to give an adequate idea of all of them.

It is claimed that it contains 300,000 words, as against 225,000 in the Century, 125,000 in Webster, 105,000 in Worcester, and 50,000 in Stormonth. This increase in number of words is not due to filling up the volume with old, obsolete words, but has been accomplished by searching all the various trades in which the growth of terms within the last few years has been very rapid. For instance, they have added more than 4000 new terms in the department of electricity alone. They have also brought out many words which relate to ancient history and customs, and to foreign religions, which have never before appeared in English dictionaries.

If one compares the words in electricity or electro-therapeutic terms with any other dictionary, it will be easily seen how the increased number of words are obtained. It is not due so much to the increased number of roots of words, although there are many such, but to the various combinations and parts of speech in which the word is used in electrical literature.

To say that the publishers have put forth great efforts to bring this dictionary up to the highest standard is but putting it mildly. The number and high standing of the editors of different special-

ties is a sufficient guarantee that nothing has been spared in this direction. The thoroughness with which they have undertaken the task is illustrated by the manner in which they tried to arrive at a satisfactory understanding on the words in which there is a disagreement of the spelling. These words have been referred, under the direction of Professor March, to an advisory committee of philologists in American, English, Canadian, Australian, and East Indian Universities, and to representatives of professional writers and speakers of English.

All this has been done at an expense of \$960,000. The massiveness of this work is almost beyond the comprehension of one man, and is certainly beyond the power of one man, who necessarily is unacquainted with all the various branches and specialties which have been so carefully worked up to adequately describe.

There is no dictionary in the English language which gives anything like as adequate return for the price of it, as the Standard Dictionary.

THE SYNOPSIS OF THE PRACTICE OF MEDICINE. By WILLIAM BLAIR STEWART, A. M., M. D., Lecturer on Therapeutics; late Instructor in the Practice of Medicine in the Medico-Chirurgical College of Philadelphia; Demonstrator in the Philadelphia School of Anatomy, etc. Published by E. B. Treat, New York. Price \$2.75.

In these days of such voluminous practices of medicine, when one publisher is vying with another to see which can bring out the largest work, it is refreshing to note the appearance of a small and condensed work on the subject. The work before us contains 433 pages, yet it goes over the ground, so far as the number of diseases considered in it are concerned, very thoroughly, but of course the description of each must necessarily be brief. The author has accomplished much by his methods of condensation. One of the principal features in this respect is that he scarcely ever repeats. An instance of this, he gives in the early part of the work, p. 21, certain rules of prophylaxis, and when in other parts of the book, prophylactic treatment is to be followed, he refers the reader to p. 21, instead of repeating what he has already written. The condensation is also characterized, first,

by the direct manner of expression, and, second, by the discarding of all superfluous words. The preface states the work is intended as a text-book on ætiology, symptomatology, pathology, diagnosis, prognosis, and treatment for the use of the practitioner and student, while it will be of great service to the former in refreshing his memory on the technique of the various parts of practice. It is with the latter class, we think, it will find its most useful field. The introduction which explains the various classifications in which the practice of medicine is divided, seems to us particularly useful to beginners. The work is well written and beautifully executed.

CLINICAL DIAGNOSIS. By ALBERT ABRAHAMS, M. D., Professor of Pathology in Cooper Medical College, San Francisco, Cal.; Pathologist to the City and County Hospital, San Francisco; Author of a Synopsis of Morbid Renal Secretions, etc. Third edition, revised and enlarged. Published by E. B. Treat, New York. Price \$2.75.

The fact that there were two editions of this work exhausted in three years, and the third called for, is all the recommendation it needs. The book contains thirteen chapters, which are natural divisions.

The author has aimed to give a broad idea of diagnosis, yet he has not neglected the special diagnosis of each disease. Wherever physiology and pathology can in any way assist in making the diagnosis, it has not been neglected. Frequently, in addition to the diagnosis, complications and sequella, as well as prognosis, is given. Every available source that could in any way furnish assistance in making a diagnosis has been brought forward.

The book is illustrated with various charts, anatomical outlines, and microscopical drawings to elucidate the text. There is an appendix of sixty pages which is mostly taken up with comparative charts and tables in diagnosing and the localization of disease. The latter surpasses anything of the kind we have seen, particularly in spinal diseases.

There is a chapter devoted to electro-diagnosis, in which the author has followed Erb, Von Zeimmsen, and others, and which he has elucidated in plain and understandable language.

The character of the work fulfills the mission for which it was intended.

TREATMENT BY ELECTRICITY, OR ELECTRO-THERAPEUTICS ;
Being a new system of treatment introduced in India. By
NONDO LAL GHOSE, L. M. S.

Dr. Ghose's little book is unique in its way, and it takes up the different diseases which are amenable to treatment by electricity and in *most* cases, says that "they yield to this system of treatment," but fails to say what battery is used, the strength of current is omitted, and the position of the electrodes overlooked. An autobiography of the author is given and the little book closes with a number of letters from natives who have been treated and benefited by the doctor. One of the letters, we suppose the best, for it is the longest, is printed in the native type and it has a few parenthetical remarks in English, such as "soap water enema," "galvanic current," and "positive pole," which, of course, can be understood by the average English doctor. We quote another letter : "I have had the pleasure of knowing professor Nondo Lal Ghose for many years past. He was respected at Dacca as a successful Doctor. Lately he treated my sister-in-law, and by the application of electric battery, in a few days, he cured her of her obstinate severe hysteria. I wish him and electropathy all success."—B.

EPITOMES.

ELECTRICITY IN THE TREATMENT OF ANO-RECTAL DISEASE, PARTICULARLY IN ANAL PROLAPSE, IN BENIGN TUMORS OF THE RECTUM, AND IN VARIOUS TYPES OF HEMORRHOIDS.

BY THOMAS H. MANLEY, M. D., NEW YORK.

Dr. Manley, through the *Medical Brief*, says that he had four cases of benign rectal tumors, which could not be removed by operation. On the first case he used a long electrode and punc-

tured the tumor. After the first treatment such an intense irritation was set up that opium had to be freely given. The tumor suppurred. It was eleven days before an examination could be made, and then only a shrunken and contracted stalk was found.

The second case revealed two mucous polypi, which occupied the anterior wall of the bowel nearly as far up as Douglas' pouch. Polypi had been twisted away twice before. With difficulty he isolated them, put them on the stretch, and transfixed the pedicles with galvano-cautery needles. They sloughed away without hemorrhage and little local distress.

The third case (man) had a growth just within the verge, and it seemed a fibrous polypus with a sessile base. It interfered with defecation. It became much smaller and softer after three weeks' puncture treatment, and the patient stopped treatment and promised to return if the benefits were not permanent.

The fourth case was a nevoid growth about three inches above the anus on the right side, and it had bled more or less for some years. Repeated electro-punctures were made and the tumor obliterated.

ELECTRIC BATTERIES AND SOME OF THEIR DISTINCTIVE FEATURES IN THE TREATMENT OF DISEASE.

BY FRANCIS B. BISHOP, M. D., WASHINGTON, D. C.

In the *Virginia Medical Monthly*, Dr. Bishop says that a gentleman, suffering severely with neuralgia of the ulnar branch of the brachial plexus, had been treated for some time by faradism and galvanism, but received very little benefit. Five five-minute applications of the indirect static spark cured him.

A profoundly neurasthenic and somewhat hysterical young lady, suffering from insomnia, palpitation, cold and clammy hands and feet, headache, and painful spine, had received very little benefit from two months' galvanic and faradic treatment. The static breeze and a mild spark with the large wooden ball, applied to the spine, gave relief in a short time.

A gentleman suffering from locomotor ataxia, had accompany-

ing it lightning pains, and had received treatment for some time with the static spark according to the most approved method, but the pain was only aggravated. Some relief was given by galvanic applications, but not much. The happiest results followed a high-tension current; the whole coil of eight thousand feet of wire was thrown into the circuit.

A young lady received an injury to her spine. She had suffered severely for four years, spending the greater part of the time in bed. Many doctors had tried many methods of treatment, among which static and faradic electricity had been used, but with little, if any, benefit. The spine was very irritable over the lower and upper dorsal regions, as well as the whole lumbar region; severe pain in the occipital region and in the spinal nerves which radiated from tender parts of the spine to the shoulders and sides quite to the end of the spinal nerves in front. A little walking quite prostrated her and intensified her sufferings. A mild galvanic current was applied every day for three or four months, and she was cured.

ELECTRICITY IN THE FUNCTIONAL DISTURBANCES OF THE STOMACH.

BY DR. MAX EINHORN, NEW YORK.

Dr. Einhorn, at his clinic in the Post-Graduate Medical School, said that he devised, about four years ago, an electrode whereby electricity may be applied with little inconvenience to all parts of the stomach. A regular connecting cord is covered with a rubber tube. At one end is an elongated bulb. This bulb is perforated several times. The bulb is placed far back in the mouth with the finger and held there while the patient drinks a glass of water, while he is swallowing gently push the bulb into the esophagus. It has seventeen or eighteen inches to travel. Ten minute applications are made with the faradic current. A large plate electrode is used at first at the gastric and epigastric regions for five minutes, then a small sponge electrode is used. At first the electrode is moved up and down from left to right in the gastric region (principally when constipation is present, the electrode is passed over the region of the ascending, transverse and descending

colons, always commencing in the right iliac region, and stopping at the left iliac region for two minutes); then the electrode is applied from right to left from the gastric region to the back and is held at the left side of the seventh dorsal vertebra for one minute (at this point the current can be made quite strong). The electrode is now returned to the front and moved gently up and down over the gastric region for two minutes, gradually reducing the current and ending the séance.

For galvanic application the negative pole is used in the stomach and a small sponge electrode is applied externally. The séance should be of eight minutes duration, two minutes below the ensiform process (the current is gradually increased to the necessary strength during the first minute), then the electrode should be moved up and down the gastric region for three minutes, then one minute upon the back on the left side of the seventh dorsal vertebra, then one minute in front around the gastric region, and then quietly below the ensiform process for one minute (the current is gradually lessened during the last minute).

In withdrawing the bulb from the esophagus, the patient should drink more water, and when the larynx ascends during the act of swallowing, the electrode can be withdrawn with perfect ease.

OBSERVATIONS.

BY C. A. WEIRICK, M. D., CHICAGO.

Dr. Weirick's paper, published in the *Journal of Orificial Surgery*, says that, after the American operation, where the anus remains open after the wound has healed, apply a large electrode over the sacrum and a rectal electrode in the anus; the faradic current should be distinctly felt by the patient, but it must not cause pain; increase the strength of the current quickly at short intervals. One treatment will often cause a firm contraction of the muscles, but some cases will need several treatments.

Either constipation or diarrhea can be improved or cured by means of one electrode in the rectum and the other on the spine or over the abdomen. The double electrode is the most helpful. A small wire is twisted in a spiral form, covered by rubber, and

should terminate in a metallic ball at one end and an attachment for the cord at the other ; the other cord is attached to the band, about two inches long, that passes over the rubber and may be placed at any point. Insert the electrode as far as desired, with the band about one inch inside the anus. The faradic current is used most frequently—positive electrode in the bowel and the negative in the anus. If this arrangement of the electrodes should not prove effective, they should be reversed.

For aching, distress, and bearing down in the pelvis, with products of chronic inflammation of the uterine appendages and often subinvolution, even where an operation is necessary, the action of electricity has been extremely satisfactory—bipolar electrode, positive against the uterus ; secondary current ; application to be made for from fifteen to twenty minutes every day, except during the menstrual flow. The galvanic current should precede this application twice a week with the active electrode (positive) covered with moist antiseptic cotton or wool. Where the uterus is flabby, with a tendency to displacement, causing a dragging sensation, but attended with inflammation or inflammatory deposits, the primary current should be used, one electrode against the cervix and the other on the sacrum or hypogastrium, the current rapidly changed from weak to strong and reversed. Great benefits will accrue from treatments made every second or third day. Where the faradic current has disappointed, the static has been successful.

ELECTRIC EFFLUVATION FOR CHRONIC LEG ULCERS.

The *International Journal of Surgery*, through the *Medical Week*, informs us that Dr. Marquant has attained excellent results by static treatment of chronic leg ulcers, the varicose variety especially. The ulcer is first washed with perchloride of mercury or carbolic acid in feeble proportions and then a thin layer of absorbent cotton is laid over it, the patient placed on an insulated seat and connected with the negative pole of the static machine. The electrode is now approached to the sore, but at such a distance that prevents the discharge of sparks, and still near enough to produce the electric souffle or wind. This séance is continued

for ten minutes and then the ulcer is dressed. Treatments should usually be repeated three times a week. Powdered subcarbonate of iron is dusted over the sore and the cotton (quite thin) applied. This dressing is changed only twice a week and the static application is made through it. Later on, the subcarbonate of iron is discontinued and the cotton alone used on the ulcer.

TREATMENT OF STRICTURE OF THE URETHRA BY ELECTROLYSIS.

BY P. L. BROUILLETTE, M. D.

Dr. Brouillette, through the columns of the *Pacific Record of Medicine and Surgery*, gives his treatment of stricture of the urethra. He uses the Newman method. He differs as to the intervals between treatments—alternate days he considers better, and finds no irritation or inflammation therefrom.

MEDICAL ELECTRICAL NOMENCLATURE.

The Virginia *Medical Monthly* publishes the criticism of Professors Houston and Kennelly (New York *Polyclinic*) upon the usual classifications of currents: 1. Faradic; 2. galvanic; 3. galvano-faradic; 4. franklinic; 5. static induced; and 6. the static breeze. They offer the following in its stead:

Continuous	{ Uniform (1) galvanic.
	{ Pulsatory (2) some varieties of the galvano-faradic.
Alternating	{ Symmetrical { Sinusoidal (3).
	{ Non-sinusoidal (4).
	{ Dissymmetrical (5) (faradic).
Intermittent	{ Oscillatory (6) (static induced).
	{ Non-oscillatory (7) (franklinic).
Convective	(8) Static breeze.

Continuous currents may be uniform or pulsatory. A uniform current is produced by the action of a uniform electromotive force. A pulsatory current is not uniform in strength. Alternating currents may be symmetrical or dissymmetrical. Symmetrical currents may be sinusoidal or non-sinusoidal. The faradic coils, under the influence of the vibrating contact breaker,

produce the dissymmetrical alternating current. Intermittent currents may be oscillatory or non-oscillatory. An oscillatory current is alternating, usually sinusoidal, but decaying in amplitude, each wave being of smaller amplitude than the preceding; if produced by the Leyden jar, they correspond to the static induced currents. Non-oscillatory currents are produced by discharges from influence machines through circuits unfavorable to the development of oscillations. The convective current, or convective discharge, is produced by the convection of electric particles of air or other material.

ELECTRICITY—DYSMENORRHEA.

Dr. F. H. Martin of Chicago, in the *North American Practitioner*, says that the electrodes necessary for the proper treatment of gynecological difficulties are few and inexpensive. Goelet's abdominal clay electrode (a modification of Apostoli's) is best and cheapest; a bipolar vaginal electrode; a set of copper, block tin, or platinum intra-uterine electrodes, three, five, and seven mm. in diameter; a Martin's flexible intra-uterine electrode, three-one-hundredth size; a flexible intra-uterine bipolar electrode; an urethral staff, with graded conical bulbs; and a bipolar rectal electrode. Dysmenorrhea, or painful menstruation, is due to obstruction, inflammation, or neuroses. Where there is a flexion, it should be corrected. The faradic or slow alternating current, with slow interruptions, should be used. Use a bipolar intra-uterine electrode, so as to concentrate the whole current in the uterus. An elastic or pliable electrode should be used, as by it the uterus can be straightened while the current is flowing. The electrode is to be introduced with care into the bent uterus beyond the flexion, so that one pole will exert its influence upon the body and one upon the neck, allowing the whole uterus to be in the circuit. The coils, after the current is turned on, are to be gradually telescoped, until a strength of current is attained as strong as the patient will bear without pain. The interruptions should not be faster than one or one and one-half a second. The séance should last from five to ten minutes, and from every day to two times a week they are to be repeated. The most aggravated case will almost invariably be relieved in a month.

Where the dysmenorrhea is due to strictures of the canal, its symptoms are much the same as in the obstructive form. Bimanual examination will disclose the shape of the uterus, and a urethral staff is molded, by first heating it, so as to conform in shape to the direction of the uterine canal, an olive point, a little larger than the stricture, is attached, and it is then connected with the cathode. The anode (abdominal electrode) is now applied. Insert the cathode into the uterine canal, guided by the index finger of the left hand, until the bulb point rests against the stricture, and a current of from 5 to 8 ma. is allowed to pass, with slight pressure, upon the electrode. If the bulb is not too large, it will soon pass an ordinary stricture. While the current is still passing, the electrode should be gradually drawn through the stricture, and then the current shut off and the treatment ended. Two days later a bulb one size larger is to be applied, and on each second or third day the size gradually increased for two or three weeks' treatment.

Endometritis, or inflammatory dysmenorrhea, often complicated with metritis, produces two kinds of pain: a dull, aching pain in the uterus, which comes on several days before the flow appears, and gradually lessens as the pelvic depletion takes place, and disappears before menstruation ceases usually; or, irregular pains characteristic of uterine obstruction, begins usually with a severe pain at the beginning of the flow and gradually shades off as the flow is thoroughly established. Galvanism, by means of the anode, is applied with an intra-uterine electrode, a pure copper sound, with a proper insulation, which is passed to the fundus, and should be sufficiently large to fill the canal. The sound should be shaped to fit the canal, and inserted so that the insulation is pushed against the cervix. The abdominal electrode is connected with the cathode and applied, and a current of from 50 to 100 ma. is now gradually turned on and allowed to flow from five to eight minutes. Applications are to be made two or three times a week for a month.

Ovaritis and salpingitis necessitate a vaginal electrode, which is placed well into the vault of the vagina on the side of the most pain, or on either side at alternate treatments, if the pain is on both sides. The cathode should be employed for the active pole.

The current should be gradually increased, but not to exceed 100 ma., and allowed to pass for five minutes at its maximum strength.

Neuralgic dysmenorrhea, under electric treatment, will not be benefited permanently without removing the cause. The galvanic current should be employed during the intermenstrual period. Intra-uterine, intravaginal, or intrarectal electrodes should be employed as the cathode (unless the uterus is the seat of the pain, when the anode should be used) and the clay pad placed upon the abdomen so that the painful portion of the pelvis is in the direct line of the circuit. From 50 to 100 ma. should be allowed to pass for from five to ten minutes every day throughout the intermenstrual period. The cases that are not benefited in a month should be treated with the fine wire faradic current at the same sitting and following the galvanic application, independently or at each alternating treatment. A bipolar electrode is best, either vaginal or uterine, unless the application is made directly after or supplementary to the galvanic, when, to spare the patient the additional discomfort of changing the electrodes, the battery may be directly attached to the instruments already in place. The current should be as strong as the patient will bear without great discomfort, and should not give pain.

LOCAL ELECTROLYSIS AND ZINC-AMALGAM CATA-PHORESIS IN MALIGNANT AND NON-MALIGNANT TUMORS.

BY G. B. MASSEY, M. D., PHILADELPHIA.

We epitomize from the *Medical News* Dr. Massey's paper on the above subject, read before the Philadelphia County Medical Society at its January meeting. Local electrolysis is decomposition by electricity—both poles of the galvanic battery are placed in the morbid tissues, from one-half to one inch apart, and most of the current will be confined to the tissues between the electrodes. Strong currents may be used and the surrounding tissues will not be affected, having been chilled by a spray, or, if sensitive, anæsthetized.

Case 1 was a large intra-uterine cystic fibroid, and it was destroyed piecemeal by repeated applications of bipolar electrolysis. A current of 700 ma. was used for six minutes at each séance.

Case 2 was a sarcoma of tonsil and soft palate cured by local electrolysis followed by zinc-amalgam cataphoresis. Cocaine was applied, and two treatments were given with a current of from 200 to 350 ma. After the eschar had separated, with some pain, and reacted, healing commenced, and, when completed, only a small portion of the growth remained. More than a year ensued before the patient returned for treatment, when he seemed to be doing well, with the exception that the growth had increased, now about a peach stone in size. The zinc-amalgam cataphoresis was mainly employed, and the bipolar electrode was carried deeply into the base of the growth, and treatments continued for six weeks, when the patient was discharged cured.

Case 3 was an inoperable carcinoma of the groin, and it was greatly relieved by zinc-amalgam cataphoresis; death occurred from erosion of the femoral artery and vein. Situated just below Poupart's ligament, and directly over the femoral artery and vein, the central and projecting portion was destroyed by local electrolysis, having a slight cavity into which a cocaine solution was poured. A blunt amalgamated zinc electrode was pressed into this daily, and currents passed averaging 150 ma. The edges with which the electrode came in contact were whitened, and this peeled off later. The whole growth was gradually destroyed and replaced by healthy tissue, except where the close proximity of artery, at the center of the base, rendered the treatment inadvisable. The patient increased twenty pounds in the three months following, and the diseased area had decreased to the size of a five-cent piece, but the deep cavity remained. The artery suddenly gave way one day, and although it and the vein were ligated, the patient died two weeks later.

ELECTRIC DERMOGRAPHISM IN EXOPHTHALMIC GOITER.

We learn, through the *Alienist and Neurologist*, that Drs. Payton and Noir, in the *Rev. Internl. de Med. et de Chir. Prat.*, state that, where the patients are suffering from Basedow's disease, and

the static spark applied, it will leave a white, livid, bloodless point surrounded by a reddish-yellow areola. The decrease of this phenomena will be observed with the improvement in the patient's condition.

ELECTROLYTIC TREATMENT OF GOUT.

Dr. Labatut, in the *Gazette des Hosp.*, the *Alienist and Neurologist* tells us, reports cases in which he has used lithium by the electrolytic method with much better results than by the mouth.

REMOVAL OF HAIR, MOLES, ETC., BY ELECTROLYSIS.

In the *Medical News*, Sorenson contributes an interesting paper on electrolysis, and reaches the following conclusions :

"Do not begin with too strong a current."

"Apply the current for a sufficient length of time."

"Always apply the negative pole to the part it is desired to destroy."

"Do not have the circuit closed when you insert the needle, until you have learned to know your patient electrically, if such use of the word be permissible."

"Always test the strength of your current before beginning. To do this it is convenient to touch the two poles in the tongue, having the points about an inch apart."

THE UTILITY OF THE ELECTRO-CAUTERY SNARE.

BY H. W. LOEB, M. D., ST. LOUIS, MO.

Dr. Loeb, in the Cincinnati *Medical Journal*, insists that the electro-cautery snare is vastly superior to any other instrument in certain operations upon the nose, as follows : In removal of nasal polypi, of redundant nasal mucous membrane, of tonsils, and of the uvula. It is as easy to engage the electro-cautery snare as the cold snare, there is less time consumed, no hemorrhage, the after effects are no more severe, more polypi can be removed at one séance and less pain, as the operation can be completed before the effect of the primary application of cocaine has worn off.

The doctor exhibited his own cautery snare before the laryngological section of the American Medical Association. Every part of the instrument is separable—canule, copper wires, iron tip, and rubber insulation. By means of two stout copper wires, which pass through the canule and have an eyelet at one end, a serviceable loop can be made out of a small piece of steel wire.

ELECTRICITY FOR FROZEN NOSES.

Dr. Helbing, a German physician, has been successful in the use of electricity for frost-bitten noses. [But it is not stated which current was used.—B.] The electrodes are applied upon either side of the nose and moved about, and a strong current is passed. The result in most cases is a reddening of the tissues, and this may last several days. From ten to fifteen applications are sometimes necessary.

THE DISINTEGRATION OF ORGANIC TISSUE BY HIGH TENSION CURRENTS.

A paper upon the above subject, read by Dr. Inglis Parsons at the March meeting of the Obstetrical Society of London, and published in the *British Medical Journal*, gives the investigations undertaken to ascertain the capabilities of electricity as a destructive agent in the treatment of malignant disease. Formerly he had found that the galvanic current for this purpose was only effective at the poles even with powerful currents. Apparently by the force of the impact, if a powerful interrupted voltaic current was used, a much greater area was injured. Too much heat and caustic action were developed if the voltaic current was increased to meet this. A transformer, made according to a special design and quantity, was turned into pressure, was capable of working up to 150,000 volts, and could be graduated from zero to the pressure required within certain limits. The primary coil was supplied by six accumulators and a manual rheotome was used, so that the operator had perfect control. Freshly killed beef was chosen as the best organic tissue to try the discharges upon, as its structure would easily show any alterations that might take place. Great difficulty was met in cutting sections

from the beef after the current had passed through it. If frozen or mounted in paraffin it crumbled away. Lowering the pressure allowed some sections to be made and the muscular fibers were found to be broken up throughout the path of the current. An air gap was then put in the circuit and the destruction was not so great. The diffusion of the current was then worked out as nearly as possible by cutting sections from different parts of a thick piece of beef after the passage of the current. The broken area corresponded nearly in shape to an elliptic spindle. With the poles six inches apart the solid area was twenty-seven times greater than at two inches. Finally a Leyden jar was put into the circuit. The character of the discharge was changed. The maximum pressure was now about twenty thousand volts, with a corresponding increase in quantity.

THE CAUTERY IN STAPHYLO TOMY.

Dr. T. A. De Blois (New York *Medical Journal* ; *International Medical Magazine*) thinks that the fixed platinum wire cautery loop is best for removing a portion of the uvula, as, after healing, the uvula is well "tapered," whereas it is "clubbed" after clipping with scissors.

THE FARADIC BATTERY IN MORPHINE POISONING.

Dr. H. R. Stout of Jacksonville, Fla., in the *Southern Journal of Homeopathy*, relates a case of morphine poisoning. Another physician had been endeavoring to resuscitate her for half an hour before Dr. Stout arrived. No action of the heart or lungs could be detected. Three faradic batteries were applied, full strength—one to the spine, another to the extremities, and the third over the heart and lungs—for two hours "before the spark of life was relighted." Then the heart began to pulsate faintly and the chest to rise and fall with the respirations. Recovery.

ELECTRICITY IN MALNUTRITION.

Dr. A. H. Goelet, in the *Medical Record*, mentions the case of a girl of seventeen years who had been reduced to sixty pounds in weight by a uterine fibroid, which extended to the umbilicus,

and, as she was too near death to undergo its removal, was systematically treated with electricity and soon enabled to go out; her weight increased to 125 pounds and the fibroid decreased to the size of a walnut.

LOCAL ANÆSTHESIA.

Dr. H. W. Yemans (*Pacific Medical Journal*), in the San Francisco County Medical Society, among other local anæsthetics, said that electric cataphoresis is of medical rather than surgical use, and is at times most valuable. A galvanic battery of fifty or more cells is used. The anæsthetizing agent is put in the cup attached to the anode and applied over the site of the operation or seat of pain. The cathode should be applied just far enough away to avoid "short circuiting." Begin with a weak current and gradually increase until a current strength is reached that can be just comfortably borne, and this should be maintained until the desired effect ensues. A localized neuralgia will require from thirty to sixty minutes. The agent may be a strong (20 per cent.) solution of cocaine, or chloroform, or ether. For the two latter a membranous diaphragm is essential.

LUPUS OF THE VULVA.

"Deep cauterization by means of an electropuncture is the most satisfactory way of treating many cases (of lupus of the vulva), for all parts of the diseased tissue can thus be reached and cicatrization secured. The treatment must be repeated as fast as the disease recurs or redevelops, until all foci are finally destroyed."—*American Text-book on Gynecology*.

APOPLEXY.

BY H. S. GARFIELD, M. D., PENDLETON, ORE.

The faradic current, the cathode over the motor points of the nerves supplying the affected muscles and the anode at the base of the brain, will assist in the treatment of this disease. The peculiarity of the case will suggest other ways of applying the current. Dr. Garfield, in the *Pacific Coast Journal of Homeopathy*, thinks that two or three weeks after the stroke is soon enough to begin this treatment. A mild current should be used

until the toleration of the patient is gauged, and the current then may be increased as fast as "circumstances justify." Applications of from five to fifteen minutes' duration will meet most of the indications and refresh the patient.

THE LETHAL EFFECTS OF ELECTRICAL CURRENTS.

BY B. H. LEWIS JONES, M. D., F. R. C. P.

Dr. Jones, in the *British Medical Journal*, has published an able article upon the above subject. He says that the number of volts passing through a wire does not give any adequate idea of the strength of the current actually passing, as the resistance is not taken into account. If the ampèrage was given instead, we would have a definite idea of the current strength. The alternating current is the most fatal to the cat or dog in the absence of an anæsthetic; but, where an anæsthetic had been given, the continuous current was found to be equally fatal. The current in these cases, the doctor says, caused death by the arrest of the respiration. Where accidents have occurred and the respiration has ceased and a feeble heart beat has been detected, artificial respiration should be performed, and it will be generally crowned with success. But if the heart has ceased to beat, too, artificial respiration will be of no avail. Where the current has not passed through the trunk, severe currents have not been fatal.

Workmen should be insulated from the ground, "and it seems that this might best be done by covering the floors of all high-pressure stations and sub-stations with a thick layer of asphalt, or with insulated platforms of considerable extent, and by covering the walls as far as possible with a non-conducting lining of wood, the insulation resistance of which might be increased by impregnating it with paraffin wax, or tar and varnish. The arrangements should be such as to make it impossible for a workman to touch any high potential conductor or machine, except when he stands upon a non-conducting surface, nor should he be able to touch at the same time a high potential conductor and any part of the building which is in electrical connection with earth. In the case of men at work, through unavoidable necessity, upon 'live' high-pressure street mains or arc lamp circuits, it is probable that the use of india-rubber sea boots, without nails,

would be a better protection than the rubber gloves, which have been several times found lacking ; at least, the use both of boots and of gloves would decrease the risk. The danger of street mains, however, is best met by permitting no work to be done upon them until they have been cut out of circuit. When, unfortunately, an accident has happened, artificial respiration should be put in practice as soon as possible, in the hope that the injury has not been severe enough to arrest the heart permanently ; and if the heart show signs of beating, however feebly, the artificial respiration must be persevered in. By the enterprise of the *Electrical Review*, a card of directions for the best method of giving first aid to victims of electric shock has been issued, and is likely soon to find a place in all central stations. It is drawn up on the lines of the well-known card of the Royal Humane Society for the restoration of the apparently drowned."

ELECTRO-THERAPEUTICS SOCIETY MEETINGS.

The National Society of Electro-Therapeutists will meet in Boston, September 18 and 19.

The American Electro-Therapeutic Association will convene in Toronto, Canada, September 3.

ELECTRICAL MISCELLANY.

—Dr. J. P. Tuttle, in Mathews' *Medical Quarterly*, says that, for the thrombic hemorrhoids, he applies the electro-cautery by means of a round platinum electrode.

—To decide whether the pulp of a tooth is alive or not, apply a faradic current, says Dr. J. S. Marshall in the *Medical Brief*, and, if alive, you will get an immediate response.

—A West Virginia physician (*American Medical Compend.*) says that he washed out the "stomach thoroughly, filled it with water through a tube, introduced a magnet suspended on a wire and withdrew a swallowed needle."

—Dr. M. W. Lang of Marysville, Mich., says, in the *Medical Brief*, that the daily, or three or four times weekly, use of elec-

tricity, according to the susceptibility of the patient, in pares-thesis, is of great benefit.

—Orion Brooks, electrician, through the *Pacific Medical Journal*, says "that if the physician would acquaint himself as thoroughly with the science of electricity as he does with the science of physiology and medicine, he could then hope to direct the mechanical electrician to prepare apparatus which would enable him to far surpass results heretofore achieved, and I believe the greatest progress will be on the lines of the universality of molecular motion in animate and inanimate bodies.

—Dr. Wm. E. Hopkins (*Pacific Medical Journal*) says that "the use of electric illumination in throat and nose work renders the examination of some of the accessory cavities so simple, and at the same time enables us to judge so accurately regarding their healthful or diseased condition, that their study no longer belongs exclusively to the specialist." Messrs. Waite & Bartlett exhibited an incandescent lamp for this purpose at the last annual meeting of the National Society of Electro-Therapeutists.

—The *American Medico-Surgical Bulletin* says that, from an electric current, when passed through the body, four necessary physical effects result: 1. electrolytic; 2. osmotic, or cataphoric; 3. thermal; 4. magnetic. All electro-therapeutic apparatus or appliances should be regarded as devices intended to apply electromotive forces to the body. Electric currents are produced under these various electromotive forces, the character of which will vary with the character of the electromotive force, and the intensity of which will vary with the resistance of the circuit on which they are impressed.

—Nearly all diseases are accompanied with pain; a large number are caused or aggravated by the presence of micro-organisms; and all diseases lower the tone of the system. To correct the three indications means to cure a large class of diseases. Give Antikamnia to relieve the pain; Salol to destroy the germs; and Quinine to tone up the system. Prescribe "Antikamnia, Quinine, and Salol Tablets," each containing two grains of Antikamnia, two grains of Quinine, and one of Salol.

THE JOURNAL OF ELECTRO-THERAPEUTICS.

NEW YORK, OCTOBER, 1895.

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ORIGINAL ARTICLES.

THE APPLICATION OF ELECTRICITY TO SURGERY—WITH SPECIAL REFERENCE TO DISEASES OF THE EAR, NOSE, AND THROAT.*

BY W. SCHEPPEGRELL, A. M., M. D.,

Assistant Surgeon to Eye, Ear, Nose, and Throat Hospital ; Vice President
New Orleans Electric Society.

The armamentarium of the modern surgeon is now incomplete without the electro-cautery and electrolytic apparatus. The extensive use made of these appliances is demonstrated by the multiplicity of instruments exhibited and sold by the various dealers in electrical supplies.

The great advantage offered by the use of electrical apparatus in surgery lies in the bloodless nature of the operations and the convenience of application, enabling us to use instruments in parts which would be much more difficult to reach by other methods. This applies more particularly to the nose and throat, and it is in this branch of medicine that the methods and instruments for applying electricity have been most highly developed.

* Read at the annual meeting of the Louisiana State Medical Society, May, 1895.

In applying electricity to surgery we make use, first, of the capacity of the electric current to heat small points of platinum, which we use to destroy or cut tissue, and, secondly, of the direct destruction of the tissues by the electro-chemical decomposition caused by the current. The first is the electro-cautery and the second electrolysis.

While the object in these two methods is similar, the apparatus for generating the current of electricity and the instruments for applying it are so dissimilar that they must be considered under two separate sections.

I had intended at first to speak not only of the electro-cautery, but also of electrolysis, as applied to surgery; but each of these methods has been so much developed that I will restrict myself in this paper to speak of the electro-cautery, and reserve electrolysis for a future occasion.

The surgical application of the electro-cautery in the last decade has been phenomenal, and not without reason. When we remember that the cautery point, attached to a wire of any shape, may be carried cold to the part in which the application is to be made, and even to parts, as in the larynx, in which we can follow the direction of the cautery point only by aid of the laryngeal mirror and reflected light—that the point may be instantly heated, the work accomplished, and the instrument withdrawn as cold and harmless as when it entered, it is not surprising that this agent has been so much utilized.

Within the last few years the convenience of the application of the commercial incandescent light current has given a strong impetus to the use of the electro-cautery.

Without going too far into the electric technicalities of the subject and showing you alarming formulæ and calculations, we know that the electro-cautery itself, the handle and conducting cords—the latter being made especially heavy for this purpose—have a low electric resistance, so that we need for this purpose a current of low voltage; but, on the other hand, as we wish to set up those rapid

vibrations in the molecules of the cautery point which we call heat, a large quantity of this current is required. Therefore the chemical battery, storage cells, or dynamo demanded for heating the electro-cautery must have the capacity to furnish a large quantity of current, some cauteries requiring as much as twenty amperes, while the pressure need not be more than five volts.*

The apparatus in use for generating electricity for electro-cauteries are the chemical batteries, storage cells, and dynamos—the current supplied by the incandescent light companies coming under the third head.

1. *Chemical Batteries.*—These are comparatively but little used at present, having been displaced by other more convenient methods. The one most used was the bichromate of potash battery, which consisted of two or more large cells containing a solution of bichromate of potash, into which large plates of carbon and of amalgamated zinc were lowered by means of a special handle or crank, whence the name of “dig” or “plunge” batteries.

The objection to the bichromate of potash battery was the want of constancy of the current generated, the bulkiness of the battery, and that it required attention which the physicians, many of whom knew little of the laws of electricity, were unable or unwilling to give it. One of the advantages urged for the plunge batteries was that it was portable. If an apparatus which weighs from twenty-five to fifty pounds, and from which the solution is liable to spill to the detriment of the battery and the surroundings, may be called “portable,” then it certainly had a right to this title.

* If the electro-cautery handle and cable together have a resistance of, say, 0.06 ohm, and if, for instance, the cells of a chemical battery should be found to have a small internal resistance of 0.06 ohm per cell, then two cells of 1.5 volts in series will be found sufficient to generate the required strength of current for the resistance, as shown by the following formula :

$$\frac{1.50 \text{ by } 1.50 \text{ volts}}{0.06 \text{ by } 0.12 \text{ ohms}} = \frac{3}{0.18} = 16.6 \text{ amperes.}$$

A chemical battery for cautery purposes introduced three or four years ago, is the Edison-Lalande—for which it was claimed that it would generate a constant current, and that it would obviate the necessity of removing the zinc plates from the solution, as in the bichromate of potash battery. The cells contain a saturated solution of caustic potash, in which plates of amalgamated zinc and of copper are permanently fixed. The liquid is covered with a layer of oil to prevent the creeping of the solution. After considerable experience with these cells, I can no longer recommend them for cautery purposes. Besides the

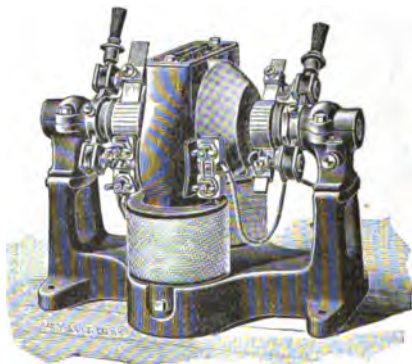


FIG. 1.

objection to their bulk and to their containing a solution with strong caustic properties, I found that in spite of good attention they deteriorated rapidly, even when not in use, so that after employing these batteries for several months I made use of the parts for other purposes. The experience of a number of other physicians who used these batteries has been similar to mine.

2. *Storage Batteries.*—The introduction of storage cells or accumulators in secondary batteries, as they are also called, was a decided advance in the methods of obtaining an electric current for cautery purposes. They have the

advantage over the bichromate batteries in that they are constant, that the plates need not be plunged in and out of the acid solution, and that they yield more than twice as many ampere hours as a bichromate battery of the same size.

On the other hand, storage batteries require charging at least every three months, even when not in use, and oftener in proportion to the extent to which they are used. They may be charged from a dynamo of low voltage, as, for instance, from the motor-dynamo here shown (Fig. 1), or from the incandescent light current by the introduction of a proper resistance, as, for instance, a 100 c. p. lamp. When these are not available, they may be charged by means of the ordinary blue vitrol or gravity battery (Fig. 2).

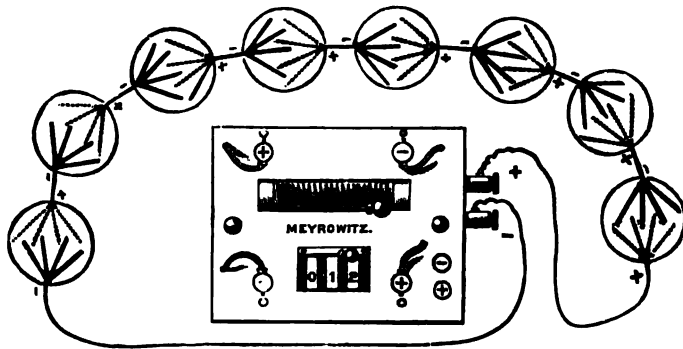


FIG. 2.

Four of these cells connected in series will suffice for each cell of the storage battery. It will take twenty-four to forty-eight hours to generate sufficient electro-motive force to begin with ; after this the storage battery, when not in use, may always remain connected with the primary cells and thus be always ready for use.

A storage cell consists of a jar or cell containing a dilute solution of sulphuric acid, into which is submerged a number of plates which are kept from coming in contact

with one another by a series of vulcanite forks. Although called "storage cells," it is not meant that they actually store up electricity. They simply store up energy in a chemical form, and this energy can be reproduced as the energy of an electric current.

Storage batteries form an efficient and safe source of electrical energy for heating cauteries. Each cell has a capacity of about 2 volts and 200 ampere hours, so that two cells connected in series will answer the requirements of most cauteries in use. The low voltage of these batteries obviates all danger to the patient, as the arc formed by the breaking of the cautery point would be insignificant.

Care should be taken that the battery be not short-circuited, as by direct contact of the conducting cords, as the lead plates would be rapidly destroyed.

The objection to storage batteries is that after being used for a year or two they become unsatisfactory, and the plates have to be renewed. At the Eye, Ear, Nose, and Throat Hospital, where we employed these batteries for several years, we found that after about twelve months' use they could no longer be relied upon. Another objection is the necessity of recharging, the batteries being frequently run down when needed by the physician, causing a delay which might be of considerable importance.

3. *Dynamos*.—The most convenient method of obtaining a current of electricity for cautery purposes is from a dynamo. This may be either from the commercial Edison current used for incandescent lamps, or from a dynamo giving a current of low voltage and large amperage, as the motor-dynamo here shown (Fig. 1).

The manner in which the Edison current was first used for cautery purposes was by the simple introduction of a sufficient resistance, as a large wire rheostat or a sufficient number of large incandescent lamps connected parallel. While this was effective as regards the heating of the

cautery point, there was a considerable element of danger which would result from the breaking or the fusing of the cautery point. The arc due to the breaking of a current of, for instance, 20 amperes at 115 volts, would inflict serious injury on the surrounding parts. To obviate this danger, shunt rheostats have been devised and now form one of the most practical methods of furnishing a current for electro-cauterics.

One of the best of these is the "K. A. P. Dynamic Cautery Apparatus." The resistance in this apparatus consists of coils of German silver wire imbedded in asbestos, the amount of current required for the cautery being shunted off by means of the crank at the upper part of the apparatus. The signal lamp above the switch is attached simply to show when the current is off or on, so that the operator will not forget to turn off the current after each operation.

The only objection that has been urged against this instrument is that it is wasteful of the current, a large proportion passing over the shunt wires. While this is theoretically true, a little calculation will show that practically it is of very little importance as regards electro-cautery work. A number of careful tests has shown me that the K. A. P. rheostat uses about twenty-five amperes of current. The commercial value of this current for *one hour* would be about fifty cents. Two minutes, however, is quite sufficient time for heating the electro-cautery in the majority of operations, so that the cost of each application would be two-sixtieths of fifty cents, or less than two cents. With a motor-dynamo, 1 ampere taken from the mains, having pressure of 110 volts and utilized for the dynamo, would furnish about 20 amperes at 5 volts (loss of ten per cent. in the conversion), which would answer the requirements for most cauterics, the cost of this current being only two cents per hour, or one-fifteenth of a cent for each application of two minutes. Theoretically the

cost of the current from the motor-dynamo is only one-thirty-third of that of the K. A. P. rheostat ; practically it is a saving of less than two cents for each application, which is a small item as compared to the necessity of keeping the motor-dynamo oiled, the brushes adjusted, and the possibility of having the armature rewound.

The above comparison applies only to the electro-cautery, and this only to private practice. In hospitals where a large number of cauterizations may be required, the motor-dynamo is to be preferred. For electro-plating and other purposes in which a current of low voltage is required to be used for considerable lengths of time, the motor-dynamo is one of the most efficient of energy-saving devices.

The commercial *alternating current* used for incandescent lamps can also be utilized to heat electro-cauterics. The K. A. P. cautery apparatus will also answer for this current. For this purpose there have also been used *transformers*, which convert the energy of a current of high tension and small strength into that of a current of large quantity and low tension. They are simply reversed induction coils and follow the physical laws of other faradic currents. A transformer is really the most economic arrangement for heating electro-cauterics, but they are not free from the element of danger, as the high tension alternating current occasionally breaks through the insulation, carrying the risk of the patient grounding a current of perhaps a thousand volts. On this account I have never used them for cautery work, and would not advise their adoption.

Motor-dynamos.—A motor-dynamo is a convenient and economical apparatus for transforming an available existing condition of direct electrical pressure and volume into the conditions required for heating electro-cauterics. They may also be conveniently used for operating the faradic coil, but, as the motor-dynamos for cautery purposes are

usually adjusted to give a current of five volts, the electric pressure is not sufficient for applying galvanism, for which twenty or more volts are required.

The motor-dynamo (Fig. 1) consists first of a motor which is operated by the available current, as the Edison incandescent light current; the rotary motion of the armature of the motor is transmitted to a shaft carrying another armature, enveloped by the same pair of field magnets as the motor; but the armature of the dynamo is so wound that the current generated has a pressure of only five volts, the remaining electrical energy being transformed into volume of current. A current, for instance, of 1 ampere at 115 volts, which is equivalent to an energy of 115 watts, is transformed into a current of 23 amperes at 5 volts ($5 \times 23 = 115$ watts), with a loss of not more than ten per cent., resulting from friction and self-induction. We can, therefore, utilize ninety per cent. of the supplied energy.

As explained before, this conservation of energy is not so profitable for electro-cauterics, on account of the short duration of these applications, but is very saving for electro-plating, charging storage cells, and for other purposes for which a long duration of time is required.

Cables.—The connecting cords for cauterics should be sufficiently heavy so as not to offer too much resistance to the passage of the current. If too light, they may not only prevent the heating of the cautery, but the cords may actually become warm. Their resistance should not exceed 0.02 ohm. On the other hand, they should not be too heavy—as this would prevent the delicate manipulation of the cautery handle.

Handles.—Electro-cautery handles (Fig. 3) are made in a variety of shapes, usually of hard rubber. A variety of handles are here shown, some being round, others square. The one which I have had especially made for my work, and which I have found the most convenient, is made of

hard rubber, corrugated on the outside and with a depression for the fingers, and having the cables soldered



FIG. 3.

within the handles. As the handle is hollow, it is exceedingly light and allows of easy manipulation.

Certain handles have an arrangement for drawing a wire loop together, for the bloodless removal of tumors, polypi, etc.; the wire, which may be either platinum or steel, being heated by the passage of the electric current. The snare here shown (Fig. 4) is a modification of the one devised by

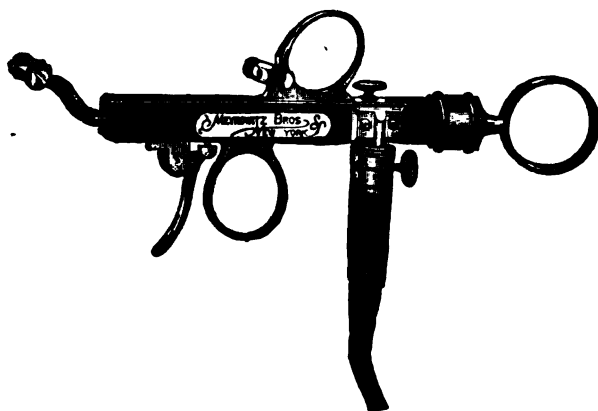


FIG. 4.

Schech, and which I have often used to advantage. I prefer to use the steel wire, replacing it with a new wire for each operation.

Cauteries.—The cautery points (Fig. 5), which are made pointed, knife-, cup-, or ball-shaped, are made of platinum soldered into copper wires of different lengths and shapes, according to whether they are intended to be used for the

nose, larynx, mouth, etc. The copper wires are insulated to prevent the short-circuiting of the current. Of the cauteries which I show you here, those which I have purchased in America and France are insulated with silk, but those which I obtained in Germany are covered with an



FIG. 5.

insulating material resembling gutta-percha, but, unlike this material, not affected by heat. The last-mentioned cauteries have the advantage of being more easily sterilized.

In selecting cauteries, you should observe that the insulation between the copper wires is good, and that the copper wires are not too light in proportion to the platinum point. If the insulation is not good, the cautery will not become heated, and if the copper wires are too light, they will not only offer too much resistance to the current, but sometimes actually become quite hot. I mention these points, because I have often seen both of these faults in electro-cauteries offered for sale.

Switches.—In order to introduce the cautery cold and be able to heat it at will, some form of circuit-closer must be used. Many handles are fitted with a kind of trigger (Fig. 3) which enables the operator to close the circuit. I have found, however, that it is difficult to retain the amount of current required for many operations when closing the circuit in this manner, and employ for this purpose some form of foot-switch.

The one here shown, which I devised a few years ago, has one peculiarity to which I would call your attention. A slight pressure with the foot closes the circuit, and when this pressure is relieved a spring raises the upper plate and breaks the circuit.

A heavier pressure with the foot, however, causes the switch to catch within another spring here shown, so that the circuit remains closed until a slight pressure from the heel releases the spring. This contrivance is convenient in case we wish to use a contact maker in the handle, as with a galvanic snare or antrum illuminator.

MEDICAL BUILDING, NEW ORLEANS, LA., April 5, 1895.

URETHRAL HYDRO-GALVANIC INSTRUMENT.

BY ROBERT NEWMAN, M. D., NEW YORK.

A direct application of electricity to the delicate structure of the mucous lining of the male urethra, which is more irritable and sensitive during the course of any inflammation, has in many cases overstimulated, and has thereby increased rather than diminished the inflammation. Some patients will tolerate the treatment, while in others it cannot even be borne.

The above difficulties caused Dr. Robert Newman of New York to construct an instrument for electrical treatment, using the principle of the electric bath.

The instrument is a conical tube of hard rubber, which can be inserted into the urethra from one to two inches. A soft rubber ring pushed against the meatus prevents leakage. A stopcock regulates the supply of the fluid. The top of the instrument is used as one binding post to attach the tip of one rheophore. The other end of the tube is used for the attachment of the rubber tube for the introduction of the fluid. The tube is lined with a platinum wire for the conduction of the electricity.

The fluid used may be simple salt water, bicarbonate of soda, or any medication, as the symptoms may indicate. A glass cylinder is used as a reservoir for the fluid, so as to ascertain by sight the quantity consumed. The lowest part of the cylinder is connected with the instrument by a rubber tube, which allows the flow of the fluid through the instrument. This reservoir is placed at a height to allow the fluid to enter the parts by its own gravity, and to be electrified without any undue pressure.

The indifferent pole is either a pad placed on any part of the body, or a sponge electrode in the hand—this last is the preference in most cases. The active pole of the battery is connected with the instrument at the binding post.

The instrument is slightly lubricated, and introduced into the meatus so far that the conical part fills up the orifice; then the rubber ring is pressed against the outside of the meatus to prevent any leakage of the fluid.

One hand only is needed to keep the instrument *in situ*, while the other hand is used to turn the stopcock which allows and

controls the afflux of the fluid to the parts—and also to regulate the current strength of the battery.

The stopcock should be so regulated as to keep the parts well filled with the electrified fluid, or even dilated, so that it enters all the rugæ of the canal. If it is wished to change the electrified fluid the instrument may be withdrawn slightly, to allow an escape of the solution, and then the stopcock may be turned on to give a fresh supply.

The galvanic current will be used in strength from 5 to 20 ma., according to the effects desired. The average time for a *séance* will be about ten minutes. Before finishing the treatment the current of the battery should be slowly reduced to zero.

The theory is to electrify the fluid by the continuation of the current through the water to the platinum wire of the instrument the same as in an electric bath.

Several prominent men have called attention to the hydro-electric application; as Beard and Rockwell, Boudet of Paris, Drs. Max Einhorn, W. H. Hedley, Newman Lawrence, and T. Clemens, who wrote as early as 1859 and 1860. Dr. W. H. King of New York constructed, about four years ago, a rectal electrode for hydro-electricity. A drawing of that instrument appeared about the same time in Waite & Bartlett's catalogue.

In Tieman's reprint, No. 10 is the description of an instrument which was used by Dr. Newman three years ago in the female bladder, and took the principle of hydro-galvanism.

This instrument is intended for electric galvanization, but can be used with the faradic current if wished. The most important use is for stimulating the mucous lining, healing ulcers or ulcerations, and absorption of pathological conditions of the urethra. If the fluid be properly medicated, cataphoresis and electrolysis may be applied.

Diseases such as abortive and chronic urethritis, and inflammations of the deep urethra can be treated by this method in a way satisfying to both patient and operator. This method is valuable in excoriations and ulcerations, diseases of the prostate, which consist mostly of inflammations and hypertrophies, and also diseases of the bladder.

The most important use of this method will be to electrify parts through the fluid which are so sensitive that a direct electric application, or even the introduction of any instrument, will not be tolerated by the patient. In such cases the hydro-electric measure paves the way for a direct electrization.

THE DEVELOPMENT OF ELECTRO-THERAPEUTICS AND ITS RELATION TO THE PRACTICE OF MEDICINE. *

Members of the National Society of Electro-Theraputists:

It is my happy prerogative to extend to you a hearty welcome to the city of Boston. We feel it an especial honor that our city should have been selected as the second meeting place of this society, and thus honored, we will endeavor to do our utmost to justify the selection.

On the part of the society, I want to make formal acknowledgment to all who have aided the success of this convention, and especially to express our appreciation of the constant encouragement and helpful suggestions of our former president, Dr. William H. King, to whom the society owes its existence and much of its present prosperity.

When we stop to reflect upon the marvelous advance our civilization has made in the last twenty years, we are struck especially by the development of that force which has long been familiar, but whose practical possibilities we had no conception of until recent years. During the years which have elapsed since the Centennial Exposition, we have seen such wonderful development of this agent which we call electricity, and in so many different directions, that we can only find a parallel in the marvelous magic of the Arabian Nights.

Since 1876, the telephone has been perfected and has come into every-day use. The electric light is now common even in country towns. The electric railroad has nearly superseded other methods of urban communication, and bids fair to drive from its place the steam engine. The recent discoveries in methods of distributing this power open up vast fields of usefulness, of which the most fanciful never could have dreamed two decades ago.

* Address delivered before the National Society of Electro-Theraputists, September 18, 1895, by the President, William L. Jackson, M. D., of Boston.

Though electricity has long been used as a remedial measure, yet its marvelous attributes so early attracted large numbers of charlatans and impostors, who made use of it to impose upon the credulous, that scientists, loth to be classed with humbugs, refrained from giving serious thought to its development. But recently great advances have been made for reasons which it may be worth our while to consider.

The newly awakened interest of scientific men has led them to renewed investigation, and consequently we now understand better the nature of electricity.

Instruments have been perfected and are now commonly used by practical physicians in their daily work.

There is a more uniform standard of measurement, which enables specialists of different countries to compare results.

Electricity as a therapeutic agent is now used by physicians well versed in electro-physics and electro-physiology.

Much insight has been gained into the effects of electricity in disease, by the careful and accurate reports of cases, from which one can form a just estimate of appropriate methods and dosage to be used. Most prominent among those who have advanced the science in this respect is Apostoli, who gives us models of exact and complete histories.

All who have devoted themselves to this subject in the last few years must recall their disappointment at the insufficient, obscure, and unsatisfactory indications for treatment given even by books from the pens of brilliant men like Erb, de Watteville, and Beard, and Rockwell. Formerly we had only three or four text-books, but to-day there is at our command quite a library, mostly written within the last four or five years. Of especial advantage to the electro-therapeutists is the recent "International System of Electro-Therapeutics," which contains the most advanced thought and methods of many leading authorities. All these factors combine to give electro-therapeutics a place in medicine un-

known to it formerly, and make it the duty of every physician to investigate the subject, for if disease can be cured more safely, surely, and speedily by electricity than by other measures, he would be remiss in his great responsibility if he did not either make use of it himself or advise its use by someone who is familiar with it.

Just here I want to make emphatic the feeling of all electro-therapists, that this remedy is not a cure-all—that it has well-marked limitations, yet clearly defined indications for use. It has a sphere of usefulness all its own, which everyone must recognize. Because a patient has received no help from an application of electricity, it does not follow that his condition may not be benefited by it. Disease does not always yield at once to medicine, and why should we expect more of electricity? In many diseases a long course of treatment is required before any result is obtained. Take, for instance, a case of infantile paralysis, where the disease has been present for a long time before coming under treatment. In some of these cases most satisfactory results have been obtained by steadily following up the treatment for from one to two years. Too common a mistake with those who do not fully understand it, is to apply it in unsuitable cases and at improper times, to the disappointment of the patient and the discouragement of the physician, when this might have been prevented by more careful discrimination in the selection of the form of current and a proper consideration of the dose.

We have at our command a number of currents from which to select, and it requires considerable judgment, based on extensive experience, to decide whether the static insulation, breeze or sparks, the static induced current, the galvanic, the faradic, or the sinusoidal is the most suitable. Not only the kind of current, but also its direction, the pole, and the dose, should be taken into consideration, and will require as much skill as the selection of a remedy.

Electro-therapeutics is no longer the careless, haphazard

practice it used to be, but is developing to the state of an exact science, having clearly marked indications for application to different diseases and requiring nice discrimination. The power to successfully differentiate between methods of treatment can only come from close study of the physical effects of the current and careful observation of its effects upon the human subject. The electro-therapist should receive as thorough training for practice as the surgeon; and he will get the best results who is enthusiastic enough to have mastered the subject, and not the half-believer who occasionally dabbles in its use.

That the profession is awakening to the advantages of electricity, Dr. King showed last year in his presidential address before this society, when he stated that the number of electro-therapeutic chairs in the different medical colleges has greatly increased. Moreover the interest aroused among the fraternity has induced the formation of two flourishing electro-therapeutical societies in this country, as well as smaller local organizations.

The underlying object of this society is to perfect our knowledge of electro-therapeutics by a mutual exchange of results and ideas. I venture to say that no one in the society claims a complete understanding of the subject, but all feel that they may receive valuable suggestions from even the youngest beginner. For this reason we welcome to our ranks all in good standing in the profession who desire to make use of electricity. Everyone can help the cause by keeping careful records of his cases, his method of administering the current, the doses employed, and finally, the results obtained. If each member of the society would do this and report experiences, whether satisfactory or not, at our meetings, we should have the data for developing and advancing this science to the place where it belongs in the practice of medicine. It should be the aim of every one of us to perfect our present knowledge, and to make careful investigations and experiments in new fields, not for our

own advantage as individuals, but with the higher aim of benefiting suffering humanity.

Already electricity has a wide sphere of usefulness. Even its physical properties, as heat and light, assist us. By means of its light, we obtain a knowledge of internal organs and parts by which we are enabled to treat them far more satisfactorily than we could without its aid. It has been proved that the effect of the electric light on plants is to stimulate their growth and improve their condition. This being a fact, it is reasonable to suppose that it might have the same effect on animal life, and indeed recent experiments with the electric light bath upon the bodies of patients have shown this to be the case.

Its power to produce heat is of especial advantage in surgery, where the cautery is used to destroy abnormal tissue. The electrolytic effect we use for the destruction of morbid growths, disfiguring marks on the face, and excessive growth of hair. By means of its cataphoric action, we can introduce medicines into the system. By its catalytic effects we may increase the circulation of a part, cause a change in the arrangement of the molecules, and even cause absorption of growths or inflammatory products. It is in diseases of the nervous system that it finds one of its most useful spheres of influence. Not only is it valuable in determining the site of disease, but it gives us most helpful aid in neuralgic affections and in paralysis. In neurasthenia we place especial reliance upon it in connection with general treatment. In gynecology, also, its power has been often proved. In spasmodic affections, in congested conditions, in exudations, in lack of tone of muscles of the pelvic organs, and even in tumors, good results may be expected in properly selected cases. In surgery, the electrolytic and cauterizing effects of the current can oftentimes be most beneficially made use of. Above all, it is one of the safest and best general tonics at our command.

To sum up, electricity may be fairly claimed to be one of

the most useful adjuvants in the practice of medicine. We do not intend to displace other methods of treatment which may be better in certain cases. The electro-therapist desires to walk hand in hand with his brothers in medicine, helping them in places where they are powerless, but leaving to the surgeon, the gynecologist, the neurologist, each his legitimate work, and asking only for recognition in those cases which can be better treated by electricity than by any other method.

In view of the wonderful development of this science during the past twenty years, who is so daring as to predict the limitations of this marvelous force in the treatment of disease? It requires no great skill at prophecy to foretell that in electricity, medicine of the future will have its most helpful ally.

ELECTRICAL OSMOSIS.

BY W. H. KING, M. D., AND F. M. FRAZER, M. D.

Electrical osmosis includes cataphoresis and anaphoresis, and is the one or the other according as the diffusion is from the anode or from the cathode. As the phenomenon has not been completely explained we will consider briefly two theories.

The first, that of the physicist, was clearly presented to our sister society in 1892, by Mr. A. E. Kennelly, and is based on the same electro-static force, "by which light particles, pith balls, gold leaves, etc., are made vehicles of energy."

The other theory—the chemical, claims that the process is entirely electrolytic, *i. e.*, if we wish to introduce the base of a salt into the tissue, the positive would be used, while the radical would be diffused by the cathode.

In the hope of throwing light on the subject, we made some experiments in the early part of the summer. A glass tube was divided into three compartments by two plugs of plaster of paris; in two of the compartments was placed starch solution, in the third a solution of I. When the anode was introduced into the I, the I disappeared. If however, the cathode was used, the I was driven, first into the middle compartment, coloring it blue, then into the positive compartment, when the color in the middle one disappeared. This is interesting as it shows iodic cataphoresis is a myth in spite of the excellent clinical results which this procedure has given, for *I cannot be diffused by the anode*. Further, the experiment illustrates interpolar action: the I goes step by step from the negative, through the middle to the positive compartment.

If, however, KI be used in place of I, the discoloration is seen only at the anode, showing that the *liberation* of the I takes place at the pole.

Morton claims that Ba Br₂ can be driven from the cathode to the anode; we were not able to duplicate this experiment. Three glasses were connected by wicks; in two was dilute H Br, in the other—the cathodal glass—was an aqueous solution of Ba Br₂. The Edison current of nearly 120 volts was run through this for three days. Traces of Ba could be found in the middle glass, but none in the positive glass, showing clearly that the base of the salt was *not* carried by anaphoresis.

With the polarity reversed, most of the Ba was found in the negative glass, having traversed the middle one. This speaks for the chemical theory of Dr. W. H. Walling. When the Ba Br₂ was placed in the middle glass, the Ba was found in the negative glass, and the Br was liberated in the positive glass. In this experiment the H Br was replaced by H Cl.

These experiments add weight to the electrolytic theory, but it must not be forgotten that water is carried physically by the current. It would seem probable then that electrical osmosis, strictly speaking, occurred only when electrolysis did not take place, and that this followed its law, bases going toward the negative and radicles toward the positive.

Discussion.

DR. WAITE: I would like to say a word only about the Leclanché bath, the invention of Leclanché of Paris. He discovered that when a solution of iodine was painted on the negative pole, it was absorbed and disappeared. You will find that different chemicals are attracted to either one pole or the other. Careful investigation along this line will bring out very valuable points. I have had good results in New Orleans by the use of a bath of Glauber's salts administered in this way, in the treatment of articular rheumatism, also in liver troubles, and other forms of rheumatism. If we could keep careful notes of our cases treated in this way, we should get something substantial in the way of records. Up to the present time everything has been done empirically.

DR. KING: In these experiments I am satisfied that the iodine traveled physically from one compartment into another. You

would first see a purple ring appear on the compartment next to where the iodine was placed, and from that the discoloration would travel to the opposite side. In one experiment we had four compartments. Two of the compartments were connected by a cork, with a hole cut in the upper part of it. When the current was turned on, the iodine would appear first in the compartment next the negative pole, and would sink to the bottom of this compartment. When it reached the cork it would begin to rise and form a discoloration in the compartment next the one in which the positive pole was; and finally it would discolor the one in which the positive pole was; then traverse the compartment to the end where the positive pole was attached by a piece of platinum wire. Therefore I am satisfied that it was a simple physical transition from one to the other compartment. We found when we took the iodide of potash and put it into one side of a U tube, with plaster of paris in the center, that the compound went to the bottom of the tube and passed through the other side, that of the positive pole, and rose to the top of the tube, where the positive pole broke up the iodide of potash, and we got the color of iodine. It is a doubtful question as to whether the potash went from the negative to the positive pole, but at any rate the iodine did go physically, without being decomposed in any way, until it reached the positive pole. There is no doubt but there are some cases in which electrolysis has much to do with it. There may be some cases in which there is no electrolysis, where the current is capable of carrying it physically, and other cases with electrolysis where only part is carried physically.

DR. FRAZER: It is hard to understand this reaction. Iodine colors starch blue. Now when we put a solution of iodide of potassium in the negative compartment, we find a discoloration showing the presence of free iodine taking place about the positive compartment, but there is no discoloration between the two poles. It simply begins at that pole and gradually works down to the septum between the positive and negative poles. If we take pure iodine, it works its way from the negative to the positive. Iodide of potash is forced through by electrolysis in combination, and is decomposed at the negative pole in some way. I think that this electrolytic action always takes place in substances which cannot be decomposed. My impression is that, in a salt that can be decomposed, the base goes toward the negative pole, and the radicle goes toward the positive pole, either free or in combination, and is liberated only at the pole. So in Dr. Waite's case, only the base would be driven into the patient.

CATALYTIC EFFECTS OF THE GALVANIC CURRENT.

BY CHAS. PORTER HART, M. D., WYOMING, O.

Although the so-called catalytic effects of the galvanic current are still, to a great extent, hypothetical, at least so far as the views held by the elder Remak are concerned, the curative and modifying influence of the current in many forms of nervous and organic diseases is a well-established fact in therapeutics. Notwithstanding the diversity of opinions still prevalent among electro-therapeutists as to the various actions, or modes of action, of the galvanic current, all are agreed as to the reality of the changes denoted by the term catalytic action, whether such changes affect the nutrition of the parts, or whether the curative action is due to changes of circulation and the movement of fluids in the tissues.

Without dwelling further on the theoretical aspects of the subject, which may or may not be of any great practical importance, I propose to add two or three illustrative cases to the already large number of therapeutical experiences known to the profession.

CASE I.—*Acute neuritis of the median nerve.*—Dr. M., a young physician, who had greatly overworked himself during the graduation term and immediately afterward attended a post-graduate course, was seized with acute neuritis of the median nerve above the right wrist, attended with great periodical suffering, numbness of the fingers, pains preventing sleep, tenderness on pressure along the course of the nerve, which is distinctly swollen and very sensitive to pressure, causing pain throughout the distribution of the nerve. His preceptor, Dr. S., applied vesicants from time to time along the course of the nerve, but without any perceptible benefit.

Desiring a change of treatment, I recommended the

daily application of the galvanic current, cathode stabile over the inflamed nerve. Immediate relief from suffering resulted from the application, attended with constant and progressive improvement, so that after three weeks' treatment he considered himself cured.

CASE II.—*Neuritis of the brachial plexus, complicated with paralysis.*—Horace N., a man of thirty years of age, a grocer, married, and temperate, has suffered all winter with what his physician pronounced to be neuralgia, attended with great loss of power in the right arm. The only treatment prescribed for it was friction with various stimulating and sedative liniments, from which no benefit appears to have resulted. At last, the paralysis became so marked that the patient was unable to raise his arm, or even use his hand in eating. Tender swelling of the plexus. Applied galvanic electricity, cathode stabile over plexus, anode to the deltoid, daily for seventeen sittings, when the patient was able to raise his arm to a vertical position, and to use it freely in eating. Continued treatment two weeks longer, when he was discharged cured.

The above cases are cited simply as *illustrative* cases, many more of which, of a similar character, might be given. Erb and others recommend the anode over the seat of trouble in neuritis, whether simple or complicated, acute or chronic, but in my experience acute and subacute cases, especially the former, are more successfully treated with the cathode. The same is true in mild traumatic cases, with or without paralysis, the best effects being secured by the stabile application of the cathode of a feeble galvanic current. On the other hand, chronic cases, especially when complicated with paralysis, as such cases usually are, are best treated with the anode to the seat of trouble, or else the anode and cathode in succession, with stabile currents. In some cases, however, the best effects are obtained by placing the cathode upon a more central portion of the affected nerve, or the corresponding portion of the spinal

cord, in order to influence the vasomotor nerves. But as a rule, the treatment is found to be most effective when applied as directly as possible to the seat of disease.

Simple peripheral paralysis, resulting from cold or pressure, and uncomplicated with inflammation, may be treated successfully with the faradic current, but where a modifying molecular or nutritive effect is required, the galvanic current alone can generally be relied upon to yield the requisite catalytic effect.

The above remarks and cases are offered more for the purpose of eliciting discussion, and bringing out the experience of others on the subject, than for any merit they may contain; since others more favorably situated have no doubt had a more extensive and varied experience with this agent than the author, whose later experiences have led him in several instances to entertain views diametrically opposite to those formerly held by the profession.

IS THE PRACTICE OF ELECTRO-THERAPEUTICS A FAD PRACTICE?

BY E. STILLMAN BAILEY, M. D., CHICAGO.

I am prejudiced in favor of electro-therapeutics because of the excellent results I have observed in my practice, and because I believe it a system that has in it a great deal of good and is yet in a state of development. I look forward with great pleasure to the future of electro-therapeutics, and shall be disappointed if it does not find an exact place in the medical science.

For one, I am sick and tired of hearing this practice called a "fad" practice, and especially is it annoying because those who shout the loudest and cry "fad" have in my observation been those who know the least about it. They could not switch the current on or off, nor tell when it was running, nor select a case where the current would be indicated or counterindicated. Their prejudices are so strong that the mention of the term electro-therapeutics sets their tongues to wagging vigorously. I cannot help feeling keenly on this subject, because of the flattery that is used to my face, and the apology that is made for me when my back is turned. Some of the self-appointed critics seem to feel that it is compassion that we specialists need. In the light of true criticism, I am as willing that the system should fail as succeed if there is no virtue in it, but I offer my protest against the haphazard statements of those who deride the system on the basis of their ignorance and prejudice, rather than from their scientific knowledge.

Seriously, are we not open to a certain amount of just criticism? Every system in its early and formative stage has been as guilty. Every new idea is upsetting to a certain extent, and nothing is more common than for a half-truth to be made to stand for a whole truth. I can easily understand why so many statements have been put in print that lack the spirit of sincerity, for enthusiasm has probably

distorted the mental vision to no small degree, and with every new system there are lots of people ready to grasp the first few truths and to rush off with them and treat the subject as though it were all the truth.

I do not consider that this branch of medicine has anything to retract more than any other branch : on the other hand it seems to me that the principles are becoming more thoroughly understood and the practice more thoroughly appreciated. It is difficult to define the word "fad." It has various meanings and I shall not undertake to explain any of them, but when the next person arises in a public meeting and says that electro-therapeutics is a passing "fad," I shall then try to find out the definition.

After ten years' experience, with the different currents my testimony is that it is a very valuable agent. It has a certain definite place in medical practice ; it is a safe, constant, reliable form of treatment ; its results are satisfactory to the patient ; its cures come nearer to the marvelous than those of any other agent that I am familiar with. Properly managed, and this is the only kind of treatment that I consider at all scientific, no harm need be inflicted to any trusting patient, no trickery need be practiced to insure its success. The current is positive, definite, and obeys its own laws regardless of the ignorance of the operator. For one I repel and deny the assertion that those who practice by these methods are "fadists," nor am I anxious at present to become a medical missionary nor to devote any of my time to the conversion of those who are so sanguine that there is no good in the use of the currents. Professional life is too short to deal with these kinds of obstacles, I would much rather put my time into the study of what has been found out, than to waste it in talking with those who do nothing but deny and denounce.

It would seem to me a better policy to build up the system on its merits though the workers be few, rather than to extend it by the indifferent and careless work of the many. The fact that our ranks are increasing rapidly, that the selection of currents is becoming more accurate, that results are far more satisfactory, and that our patients are acting as the agents for advancing the system, points to a reasonable denial of the statement that the practice is a passing "fad."

ELECTRICITY IN DYSPEPSIA.

BY MEDERIC T. LAJOIE, M. D.

This subject, dyspepsia, is not one unknown to you, therefore I will not detail the causes or symptoms of this so-called disease, for dyspepsia *is not* a disease. *It is only* the symptom of a troubled action of the stomach, nothing more, showing that food is not properly acted upon by the stomach.

Now we all know that the nerves presiding over digestion are the terminal branches of the right or left pneumo-gastrics, the sympathetic and the solar plexus also sending important branches to the stomach, and consequently a digestive disturbance is quickly telegraphed to the brain. It is also known that every muscle, every blood vessel, every gland, etc., is under the power of the nerves.

Of all this I remind you, because electricity affords especial benefit where the nervous system comes in as a factor, and in dyspepsia electricity has indeed given great results.

I shall not read to you the sixty odd observations of dyspepsia cured by electrical treatment, but I may give you a few of the most interesting.

OBSERVATION XXI.—A young man, aged twenty-seven, Mr. L., came to me in 1892, having been troubled for the last two years with more or less heaviness in the head. There was no pyrosis, no gases were belched up. There was no vomiting or nausea. The bowels were regular, though at times somewhat costive. But what the patient came to me for was this, a symptom which I have been unable to find mentioned in the books I have read on dyspepsia, viz.: Almost every night he felt a soreness all over the abdomen. Pressure would neither increase nor diminish the soreness, but change of position would. This would be felt from two or three o'clock in the morning, until half an hour after rising. The soreness caused uneasiness and

sleeplessness. Meals were taken regularly and did not distress him nor cause any trouble ; apparently digestion was good.

After a thorough examination, and, I must add, some hesitation, my diagnosis was : "Intestinal nervous dyspepsia." (This is what my note-book tells me.)

After a fourteen weeks' treatment with static electricity he was perfectly well and has so remained up to three days ago, when I last saw him. The positive pole was connected with the stool and the negative used to draw the spark, commencing with the pointed electrode, then gradually coming to the one with the large ball—the sparks increasing in intensity as I went along.

OBSERVATION XXXVI.—That of Mr. S., thirty years old. After examination and history of the case, I concluded to give him the Ewald tests, with salol and iodo-potassium at his next morning's meal, and examine him an hour after. The man was rather thin. After examining the stomach, I was surprised to feel the cardia hard under my hand, then gradually that hardness went on as a wave toward the pylorus ; one could *see* the peristaltic action of the stomach.

The tests showed retardation of digestion. After ten weeks of electrical treatment the man was well and digestion was normal.

OBSERVATION LVIII.—Mr. H. sent for me, August 10, 1895, for heart disease. For the last three weeks he had been unable to sleep more than a few minutes at a time, his heart *thumped so hard*.

No organic trouble was found upon examination of the heart. Gas was belched up frequently. This patient was living on milk, oatmeal, and the like. I gave him as a diet the white of two eggs beaten in spring-water, five or six times a day. Positive static electricity as treatment was given every day for the first week, then every other day.

In twelve weeks that man could eat and digest steak, chops, etc., and his heart caused him no more trouble.

OBSERVATION IX.—Mr. E., aged twenty-six. Food takes a long time to properly digest ; gas belched up ; nausea recurs frequently ; no vomiting ; bowels irregular ; headaches often ; pain in the back along the spine, and obliged to urinate very often, but it is painless. Rides his bicycle often.

Faradic current with coarse coil was given, positive pole over the stomach, negative in the lumbar region. I made this patient stop riding his bicycle, and with the electrical treatment he was made well in eight weeks.

This case bears great similitude with what is called "railway spine." I am inclined to think this was a case of spinal irritation caused by too much bicycle riding. May we not, therefore, call this "bicycle spine."

I will limit my reading of observations to these, but will now present a few conclusions:

1. In every case of dyspepsia, static electricity will cure or help to cure. Even a case of cancer of the stomach has been greatly benefited by this treatment.
2. Neurasthenia or hysteria manifesting themselves by dyspeptic symptoms are always cured or benefited by electricity.
3. Electricity has the effect of stimulating the general nutrition.
4. It has the effect of correcting any insufficient or perverted innervation of the stomach.
5. Of regulating, first, the action of the glands of the stomach, and, second, the hydrochloric acid in the stomach, lessening it when the quantity is too great, and increasing the amount when too little.
6. Our organism is a thermo-electric cell, with this difference: A thermo-electric cell receiving heat returns electricity, while our organs receiving electricity return motion, sensation, or trophic action.
7. The body appropriates for its wants just what it needs, the surplus is done away with through the soil.
8. Give treatments from five to fifteen minutes duration, beginning with small doses, gradually increasing them as the benefit is greater, until the maximum beneficial dose is reached. The state of the patient being your *meter*.
9. When nutrition is disturbed, electricity has the especial effect of bringing it back to the normal, and that result never fails when there is no irreparable anatomical lesion.
10. Electro-therapy, in every disease where the nervous system

is a factor, will help greatly, if it does not itself alone effect a cure.

11. As Professor Fleming demonstrated last January, static electricity has enormous tension, with no quantity. For four years I have been combining galvanic and static electricities, and will say that in using both electricities at once, "the quantity that is wanting in static electricity is supplied by the galvanic, and what tension is lacking in galvanic electricity is provided by the static."

So that the body is receiving what comes nearest to perfection in electricity, for what is wanted in the one is supplied in the other, and the beneficial effects upon the system are greater and more apparent than when only one kind is used.

Discussion.

DR. COLBY: During the last few months this matter has come to be one of great interest to me. It is this sort of dyspepsia, with the soreness and stiffness of the abdominal muscles, this pain and bruised feeling. I am going to say a few words from personal experience. For a number of years, after any undue exertion, I have gone through something such a series of sensations as the doctor cites in his first case. There has been the incarceration of flatus, the inability to digest as I should, and finally an actual diarrhea taking place; the whole trouble seeming to be due to enteric disturbance. I have met the same thing in many others. All at once I discovered that with this train of symptoms I had a tender spot just at the edge of the floating ribs. This spot was not much larger than the bulb of one's thumb. Continued pressure on this spot reproduced these pains, this lameness and soreness, this feeling in the epigastrium which had momentarily disappeared. Since that time I have watched the same thing in my patients. I have come to the conclusion that this is intercostal neuralgia, affecting a very small portion of one of the intercostal nerves, from which comes a disturbance of the abdominal walls, and the enteric symptoms are reflex from this. So we get a reflex dyspepsia and diarrhea. In these cases electricity would be a most excellent curative agent.

DR. KING: It is my belief that most of the cases of dyspepsia which were described in this paper were reflex from some cause acting on the nervous system. They might be from kidney, ovarian, or any other trouble acting on the nervous system.

DR. COLBY: I should say these cases are reflex from the local effects of pain. I think fully nine-tenths of dyspepsias are reflex from some other focus of irritation.

DR. FRAZER: Apostoli says that every case which is purely reflex can be cured. It makes no difference what the origin is; if reflex, it is curable. The essential point in the treatment is the placing of the anode over the pneumogastric. In Dr. Lajoie's cases he puts the cathode over the epigastrium, while Apostoli puts it in the left hand.

DR. COLBY: I think that anyone who makes such a broad statement as this has not had much experience with the cussedness of the American nervous system.

DR. WAITE: Speaking of treating the pneumogastric, this was used a good deal sixteen or eighteen years ago, by a number of specialists of that time. I used to make many electrodes of this description, but for the last ten years have made none at all.

DR. LAJOIE: I would like to say one thing about reflex dyspepsia. It is quite true that dyspepsia can be caused by floating kidney, or anything of that sort, but there are many cases where you can find absolutely no cause for it. The results in cases treated by static electricity are really excellent, and I hope that the members will try it and report at our next meeting.

DR. DENORMANDIE: I cannot quite see how, the cause remaining, the case is to be cured.

DR. LAJOIE: I have had just such a case in a lady twenty-nine years of age. The kidney was way down in the iliac fossa. This case was cured, so far as all symptoms of dyspepsia were concerned, for fourteen months. The electricity seemed to stimulate the kidney, but as soon as the treatment was stopped the dyspepsia returned.

DR. COLBY: I wish to call the attention of the members to the fact that, while the original lesion may not be cured, there is a vast variation in the amount of trouble that any lesion will cause, in different subjects. By treatment we are able to relieve the surplussage of reflex irritability, and reduce it to what is more nearly the normal limit. A certain degree of lesion in two different people will produce vastly different results. In gynecological practice we have seen a complete procidentia produce almost no symptoms, while in another case, with a very slight degree of deviation, there will be trouble enough to run an electric car.

THE ELECTRICAL TREATMENT OF ENDO-METRITIS.

BY WILLIAM L. JACKSON, M. D.

I N these days when surgery is paramount in the medical world, and when the first impulse in undertaking the treatment of a case is to consider it a favorable one for operation, I desire to enter an earnest plea for greater conservatism and more careful consideration of other means, less brilliant, perhaps, but equally as efficacious as the curette. I desire particularly to point out that in electricity we have an agent which, in many cases, will accomplish a cure by less heroic means more safely, and with less suffering, than can be done by any other method.

Apostoli, the great teacher, was the one to first call attention to the advantage obtainable by the use of electricity, and since his first paper was presented, in 1886, many modifications of his plan of treatment have been suggested, all conducing to the more intelligent use of electricity, and greater accuracy in the selection of cases suited to this agent, thus producing better results.

Apostoli advocates the use of currents from 75 ma. to 250 ma. for from three to ten minutes, the positive pole in the uterus when there is hemorrhage, otherwise the negative.

The active pole placed in the uterus is either of platinum or carbon. The indifferent pole, a large dispersing electrode, is placed on the abdomen. The effect produced is a chemical galvano-cauterization of the tissues with which the active pole comes in contact. Following Apostoli's suggestions, various modifications have been advocated.

The method which I have followed with the most satisfaction is that of Gautier. My treatment is as follows:

The vagina is thoroughly irrigated with a solution of corrosive sublimate, 1-3000, or with creolin ten per cent.

or lysol one and one-half per cent. A metallic sound of copper or zinc, as large as will pass through the cervix, is introduced to the fundus and held there steadily during the treatment. I prefer the sticks of copper made by Gaiffe to the copper tips made in this country, which are too short for many cases, and consequently cannot reach every part of the endometrium, as should be the case. If it is not desired to affect the cervix, a coating of shellac dissolved in alcohol will limit the action of the electrode to the portion remaining bare. The part of the sound that is in the vagina may be prevented from contact with the walls by a sheath of celluloid.

Most electro-therapeutists condemn the use of the speculum in the introduction of the sound or of the electrode, but I fail to see the disadvantages claimed, and believe that I can apply the sound with greater nicety and less pain through the speculum than with the finger. It seems to me also that there is less danger of conveying germs to the endometrium through the sterilized speculum than with the finger alone in the vagina. I would suggest the use of a round celluloid speculum, which can be perfectly sterilized, and which will not inconvenience the patient by its weight during the treatment. Another point in its favor is that, as it is a non-conductor, there will be no straying of the current if the electrode rests upon it. After the douche the speculum is introduced, and, finally, before passing the sound, the os is again irrigated through the speculum. The electrode is sterilized by being passed through the flame of an alcohol lamp, or by being boiled in water, afterward being kept until used in an antiseptic solution. At the first treatment we may make use of a platinum sound in order to best test the susceptibility of the patient to the current, using either the positive or the negative pole, according to indications given later.

With the sound in position, the current is gradually let on by means of a current controller, and a maximum in-

tensity of 25 ma. applied at the first treatment. This strength may later be increased to 60 ma., but this should rarely be exceeded. The duration of treatment is fifteen minutes, after which the current is gradually reduced to zero, reversed, and 15 to 20 ma. are allowed to pass for seven minutes. This is done to free the electrode from its adhesions to the endometrium. The electrode is carefully removed with a slight rotary motion, which facilitates its separation from the adhesions formed. Sometimes it is found to be very closely glued to the uterus, the condition being proportional to the strength of the current.

After the removal of the electrode and speculum another douche is administered and the patient made to lie down for thirty minutes. Only two treatments should be undertaken during each intermenstrual period.

The choice of the pole is governed by the quantity of the flow. If menstruation is excessive, the positive pole is introduced into the uterus; if diminished in amount, the negative is indicated. When the negative is the active pole it is better to use a platinum electrode, when the reversal of the current will be unnecessary.

The indifferent or discharging electrode is either made of clay or of metal, covered with some conducting material like amidon. It is placed upon the abdomen, and, in order to secure firm contact with the skin, a small, flat sand bag is placed over the electrode.

During the treatment the patient rarely complains of pain, unless there is great sensitiveness of the uterus, when the passage of the sound may cause considerable discomfort, and, during the application, pains running down one or the other crural nerve. Should the uterus be intolerant of the presence of the electrode, the galvanic current may be preceded by the faradic.

There should be no sensation under the indifferent electrode, unless the current be very strong, but at the reversal of the current for a minute a burning prickling of the skin

will be felt. If proper care be taken, there should be no blistering of the skin. There will be in most cases a bloody discharge from the uterus, which will last several days, and may even run into the next regular period. The patient should be forewarned of this, lest she be discouraged or unnecessarily alarmed by it.

In regard to the selection of cases best suited to this plan of treatment, I am ready to admit that patients afflicted with septic or gonorrheal endometritis would be more safely treated by active surgical measures; but the majority of cases of uncomplicated endometritis, I believe, can be cured as safely, surely, and satisfactorily by electricity as by any other means, and, in addition, we have the added advantages that this treatment does not require anæsthesia or confinement in bed, there is no shock from operation, and the treatment is usually not attended by pain. Cases have been under my care which have resisted other methods, even curetting by some of our best operators, and have been cured by electricity. Sometimes even one treatment suffices, when other methods had been tried for some time without avail. A marked lessening of the pain is one of the first results, followed by a diminution of the uterine discharge and a lessening of the hemorrhage.

Another point where the electrical treatment is of value is in the assistance which it gives us in the diagnosis of inflammatory conditions of the ovaries and tubes. Apostoli has shown that invariably where there is an inflammatory reaction following the use of the current, there must be a collection of pus within the pelvic cavity.

Undoubtedly some physicians report cases of failure in the use of electricity, but there is some especial reason for this lack of success. I should not be willing to acknowledge that the means had failed unless I knew something of the skill of the man who employed the agent, for everything depends upon the technique. It is the enthusiast on any subject that gets the most brilliant results—not the man who half understands or half believes in a method.

This is certainly not a form of treatment which a novice in electricity should attempt to apply.

The galvano-chemical cauterization, interstitial electrolysis, or metallic electrolysis, whatever name may be given to this process, produces a destruction of the diseased lining membrane of the uterus, similar to that produced by the application of chemical caustics, without the liability of cicatrization of the latter. It is followed by a healthy, new development of the endometrium. It does not prevent the uterus from resuming its customary functions after the treatment, and, as Apostoli has pointed out and I have verified in three cases, it causes no bar to pregnancy; in fact, in my cases, it was the means of rendering such a condition possible.

As to the fear of producing sepsis from introduction of germs into the uterus, this cannot be possible any more than with any other method, provided full antiseptic precautions, such as are advised by Apostoli, are carried out.

The method has the advantage not only of accomplishing what the curette and chemical applications do, but also, as we may infer from the results obtained, and from its known action in other similar applications, it exerts a local stimulating effect upon the trophic nerves, causing renewed activity of the cells, and, by improving the circulation, relieves the congestion and stasis so often present in these cases. Finally, I would suggest, as a result of our increased knowledge of methods of treating endometritis, that we should discriminate more carefully in our selection of cases for one or the other method, and as I do not advocate the use of electricity in all cases, so, too, may I claim that there are many who would be best treated by electricity. Let the electro-therapeutist turn over to the surgeon especially those septic cases which I have referred to, and let the surgeon reciprocate by staying his hand in cases of simple endometritis, where the patient can be saved the disadvantages of an operation, and be cured safely and surely by milder measures.

EDITORIAL.

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ELECTRO-THERAPEUTIC MEETINGS.

Again we give the space usually occupied by the editorial to the numerous papers which have been read at the meetings of the societies of electro-therapeutics.

The two meetings which have been held furnish a mass of very excellent electro-therapeutic literature, the immense value of which it is not easy to estimate, and which will be presented either in full or abstract to the readers of this JOURNAL.

The National Society of Electro-Therapeutists elected the following officers for the ensuing year :

President : A. B. Norton, M. D., New York.

Vice Presidents : F. A. Gardiner, M. D., Washington ;
Clara E. Gary, M. D., Boston, Mass.

Secretary : F. M. Frazer, M. D., 224 West Fifty-ninth Street, New York City.

Treasurer : J. B. Garrison, M. D., 111 East Seventieth Street, New York City.

The Executive Committee consisting of the officers and W. L. Jackson, M. D., Boston, and W. H. King, M. D., New York.

The next meeting will be held in New York city, Sep-

tember, 1896, the exact date being left to the Executive Committee.

The American Electro-Therapeutic Association elected the following officers for the ensuing year :

President : Dr. Robert Newman, New York.

Vice Presidents: Dr. Alfred Walker, Toronto ; Dr. D. B. Weaver, Reading, Pa.

Treasurer : Dr. R. J. Nunn, Savannah, Ga.

Secretary : Dr. Emil Heuel, New York.

Executive Council : Drs. W. J. Herdman, Ann Arbor, Mich.; W. J. Morton, New York ; G. Betton Massey, Philadelphia ; Wendell C. Phillips, New York, and Emil Heuel, New York.

The next meeting will be held in Boston, September, 1896.

ORIGINAL TRANSLATIONS.

NEW FACTS ABOUT THE USE OF ELECTRICITY IN GYNECOLOGICAL DIAGNOSES.

TRANSLATED BY F. M. FRASER.

By MM. Apostoli and Le Bec in *Archives d'Electricité Médicale*, May, 1895.

I have already twice called attention to the diagnostic points which the electro-gynecological treatment can and ought to furnish.

The importance of this subject is unquestioned: I intend to present the facts which so successfully substantiate the position I have defended for many years.

If medical diagnosis is useful, and often even indispensable, in determining the legitimate treatment, it is surely more important when the therapeutics can imperil the life of the patient. This is the case in gynecology, and it is to be hoped that the exploratory laparotomy, which has been so abused, will disappear, or be confined to the strictly necessary cases, by the adoption of our method of investigation.

We ought then to receive with favor anything which tends to throw light upon our operatory conduct in advance, and to justify all surgical intervention.

I have shown you the means which the electrical treatment can furnish for this purpose. I will finish by citing, with my friend Dr. Bec, two new, very interesting cases.

The important fact, which I presented to you last October, drawn from the post-operative galvanic reaction based on the *state of the uterus*, properly so called, answered this question: Are there fibromata on which we should operate, and which absolutely demand surgical intervention? Yes, I replied, fibro-cystic tumors, and tumors undergoing malignant degeneration.

No, I said, in other cases, with rare exceptions which I will not consider here, and, according to my experience, intra-uterine galvanic treatment affords me the best means for determining that a fibroma, which at first seemed simple, with good galvanic toleration, had undergone degeneration, because it had lost this same galvanic toleration, and that an immediate radical operation was indicated.

To-day I will consider only the uterine periphery, and show you all which galvanism tells of the adnexa if diseased, and to what degree; if, given a cystic tumor, it is suppurative or simply serous; if, in a word, conservative methods may be used, or if a radical operation is demanded: and, in the latter case, whether a vaginal or abdominal operation be preferable.

The cases I shall give will be the best demonstration:

CASE I. *Résumé*.—Woman, twenty-nine years old, lymphatic and very nervous, ill five years with a double inflammation of the adnexa, following probably a miscarriage occurring in 1881. No result from the classic treatment (vesication). Partial but not complete amelioration by a first electrical treatment given from 1886 to 1887 (nine intra-uterine galvano-caustics and a vaginal galvano-puncture). Suspension of all treatment for seven years, and continuation of the same anatomical and symptomatic situation. In July, 1894, verification of a tumor of the adnexa, painful to the touch and quite hard, filling the Douglas *cul-de-sac*. Is it suppurative, inflammatory, or simply cystic? The diagnostic point elucidated by the galvanic treatment, from the 29th September to 24th November, 1894, sixteen positive intra-uterine galvano-caustics varying from 50 to 90 ma. and finally one single negative intra-uterine galvano-caustic, at 70 ma., neither febrile reaction after the operation nor marked symptomatic amelioration. Laparotomy obligatory. Confirmation of the galvanic diagnosis before the operation. Cystic tumor serous, large, from the right tube, without traces of suppuration or recent inflammation of the adnexa.

Madame D., twenty-nine years old, living at Targniers-Tergnier (Aisne), was sent to Dr. Apostoli by her friend Dr. Dubousquet-Laborderie in November, 1886.

Family History.—Very nervous but no nervous crises, laryngeal constriction and tears without cause. Father died during the war, of small-pox, aged thirty. Mother living, aged sixty, healthy, has had articular rheumatism. One sister died, aged thirty-seven, in childbirth. Patient subject to angina in her childhood, has had crises of laryngitous stridulous for some years. Measles when twelve years old. Menstruated at twelve, always regularly, with a little dysmenorrhea the first day since her marriage, and with medium quantity. Married at seventeen. Miscarriage probably at a month and a half, five years ago, chill two days afterward and violent pain, especially in the right side of the abdomen, resembling peritonitis, but without meteorism. Treated by leeches, remained ill a month, and six months in bed. In 1882 consulted M. Guérin Poze, who diagnosed a flexion of the uterus (?). In 1886, she moved to Paris; had a tiresome business (wholesale merchant of wine) and remained all the day upstairs, and was attacked with rapid and severe pains in the abdomen, which obliged her to remain three or four months in bed; treated by Dr. Dubousquet with vesicants and topical applications on the right hypogastrium without any marked result.

Diagnosis.—I was called in consultation the 29th November, 1886, and I discovered inflammation in both adnexa, more acute to the right, with very marked infiltration in the Douglas *cul-de-sac*.

First Electrical Treatment.—From the 11th December, 1886, to 21st February, 1887, I applied nine negative intra-uterine galvanocaustics, small dose, averaging 20 to 30 ma., and for five minutes each time. All these treatments, made at the house of the patient, who was in bed, were generally well tolerated and were not followed by any very marked post-operative reaction. On the 25th February, 1887, a complementary negative galvanopuncture was made in the Douglas *cul-de-sac*, under chloroform, with the assistance of Dr. Dubousquet, a filliform trocar being introduced several millimeters, in the center, at the seat of inflammation lying in the Douglas *cul-de-sac*, and to the right. All these electrical operations, in which there were no unpleasant incidents, were followed by a partial recovery which unhappily was not complete,

on account of the interruption of the treatment caused by her departure from Paris. From this moment all active treatment was suspended during the seven years which she was not in Paris, and the frequent news which she wrote me from time to time showed that her physical condition remained about the same. Always the same pains, the same weakness when walking, almost constantly in bed fourteen days in the month, and the same alternacy of crises followed by rare periods of remission. The only symptomatic change which followed the galvanic puncture and which was durable was the disappearance of pain the moment the menstruation commenced. This was the time that she felt the best, especially before the menstruating, when an amelioration set in to end with the menses.

Then she decided to return to consult me and to complete the treatment which had been interrupted seven years ago.

Actual State, 17th July, 1894.—For three months she suffered more on the right side, to which were added lumbar pains. Sometimes, more rarely, she suffered in the left side. She complained at the same time of heartburn, nausea, of megrim, and of very frequent headaches, and felt a pain in the right hypogastrium, "an engorgement" she called it, with a weight at the rectum, to which she, being very constipated, attributed all her trouble; besides she is very nervous, excessively impressionable, without however having hysterical crises.

Diagnosis.—Large uterus with an ante flexion and a right latero-version. A hard tumor in the adnexa, painful on examination, large, and adherent posteriorly. The uterus being pushed to the right, this tumor seemed to leave the left *cul-de-sac* and fill the Douglas *cul-de-sac* entirely, being lost behind the uterus in front of the sacrum.

This tumor is characterized, first by its large spherical development, then by its marked tenderness, and, finally, by its hardness in some places, while at others it scarcely felt like a solid tumor.

Undoubtedly it is a tumor of the adnexa, concerning which many important questions arise. Is it suppurative, inflammatory, or simply cystic? The answer to this question should determine the choice of treatment (conservative or surgical), and in the case of a radical operation, ought to decide absolutely for or against the

vaginal or abdominal method. I saw at once, considering the history of the case, that probably only a radical operation would be effective ; the necessity for it, however, not being immediate, I decided, on the formal invitation of the patient, to make a second electrical trial before abandoning all hope of conservation, and though I was persuaded in advance of the probable futility, we would gain valuable data to establish the diagnosis.

Second Electrical Treatment.—The first, intra-uterine, galvanocaustic, + 40 ma., five minutes, on July 26, 1894, had no reaction except a little lassitude in the lower abdomen. The night and the day following were good, except for a little pain in the left side accompanying rising and sitting ; the patient had just menstruated, and afterward was always better. The second and third treatments, 50 ma. +, on the 28th and 31st July, were followed by no appreciable reaction. The patient went to the country on a vacation, and returned to the clinic September 29, 1894. During this absence of two months nothing particular happened. She complained always of her right side ; the excitement of the return and of the tentative operation caused an intense migraine with repeated bilious vomiting, lasting forty-eight hours. She had already had two similar attacks, two and three years before, but they were less severe, and later she had another, quite intractable for three days, because a patient whose bed was next to hers was chloroformed. Sixteen more intra-uterine treatments (50, 70, 70, 90, 80, 60, 60, 50, 50, 40, 60, 50, 40, 35, 50, 40 ma.), usually of five minutes duration, were made about three times a week from September 29 to November 24, 1894 ; there was neither an intense operatory nor post-operatory reaction. The symptoms of the patient were not modified by the treatment ; the same sickness persisted, making locomotion very difficult, with occasional intermission of varying intensity. Appetite good, but pain considerable at the right, though it did not disturb her sleep. Finally, on November 29, in order to demonstrate the absence of inflammation and of suppuration in the adnexa, and in order to study better the character of the post-operatory reaction, if one could be produced, we gave her for the first time—treatment 70 ma. for five minutes, the sound being pushed to the fundus. Although well tolerated, the séance was followed that

night and the next day by pain in the entire abdomen, which felt, she said, like a tearing out of the abdomen and kidneys. There was, however, no fever nor anorexia ; in a word, no manifestation of acute inflammation.

The only result was to advance by six days the menstruation, which was due the 10th of December, not surprising after a negative intra-uterine application.

The local electrical treatment being unsuccessful, from a symptomatic point of view, and having thus acquired a knowledge that I would not find a suppurating ovaro-salpingitis, I decided on an operation.

Report of the operation made by Dr. Le Bec, January 10, 1895.—On opening the peritoneum, adhesions of the omentum could be seen. The right tube did not seem very large, the left did not appear to be affected. Lace-like adhesions bound the intestine and had to be destroyed before they could be raised.

a. Left side.—Numerous adhesions between the intestine and the left tube. The left tube and ovary were abnormally high, the fimbriated extremity being fixed to the sacro-vertebral synchondrosis by a fibrous band. No tumor of the tube, which appeared to be only catarrhal, though the ovary contained small cysts. No pus.

b. Right side.—The right tube distended, resembling a thin intestine, had its fimbriæ extending into the Douglas *cul-de-sac*, where it was fixed by easily broken adhesions. The ovary, which was intact, was also fixed by numerous adhesions to the uterine wall. The utero-ovarian ligament was much shortened. Finally, there were slight adhesions between the anterior and posterior walls of the uterus and the proximate organs, which could be readily broken with the fingers. The right tube, twelve centimeters long and ten in circumference, looked like a large sausage. It was filled with a transparent fluid which made it look like a vaginal hydrocele.

Conclusion.—Here, then, is an instructive case where the galvanic diagnosis has been confirmed by a subsequent laparotomy. The galvanic indications were very clear, stating that there was neither pus nor recent inflammatory processes, and, in fact, we have found no trace of a recent inflammation of the adnexa,

and the cystic fluid in the tube was absolutely serous and transparent, without a trace of either local or peripheral suppuration. The many adhesions found were old, and not connected with any actual inflammatory process. This same pre-operative behavior with galvanism ought in the future to affect our operations and, if not to stop them, at least to advise us to perform one less radical. Thus in a case of a non-suppurating tumor, projecting into the Douglas *cul-de-sac*, a simple incision in the posterior *cul-de-sac*, with the evacuation of the hydro-salpinx, would suffice to cure without the irremedial mutilation of the woman. In the case of a final failure, a second more radical operation could be made.

CASE II. (*résumé*). Woman of twenty-eight, with small, very hemorrhagic fibroid. Treatments from February, 1892, to September, 1894—fifty-one in all, intra-uterine galvano-caustic, usually with large dose. Symptomatic success at first; later, failure. Absence of marked post-operative reaction, and the integrity of the adnexa demonstrated by this galvanic treatment. Final malignant degeneration of cervix. Same intra-uterine galvanic tolerance preserved. Abdominal hysterectomy. No trace of lesion of adnexa, and confirmation of the pre-operative diagnosis.

Mme. L., æt. forty-eight, washwoman; one child, twenty-seven years old. January 30, 1892, sent to Dr. Apostoli's clinic by Dr. Gernard; had been ill for some years. The symptoms were as follows:

Actual symptoms.—1. Continuous abdominal pain, especially on the right side, and extending into the rectal region. They are augmented by the least fatigue. (Began fifteen to eighteen months ago.) 2. Menorrhagia for four months, lasting ten to twelve days, confining the patient to her bed because of the quantity, but painless. 3. Much leucorrhœa, which had lasted for a long time.

Diagnosis.—On examination, a retro-placed uterus was found with an interstitial subperitoneal fibroid as large as a small orange, which hung down the posterior wall and resembled a retroflexion. No inflammation of the adnexa. Depth $8\frac{1}{2}$ centimeters.

The treatment, commencing February 4, 1892, can be divided into three periods, separated by different intervals.

First period.—Until the 13th of August, 1893. From the beginning six + intra-uterine galvanic treatments, five minutes each time, the doses being 50, 120, 165, 100, 75, 100 ma. It was always well tolerated, and without too much post-operative reaction.

Then twenty-eight intra-uterine applications of the alternating sinusoidal current were given. The result, as far as the pain and leucorrhœa was concerned, was favorable, but did not still the hemorrhage, probably on account of the insufficient hemostatic action of the alternating current. Two menorrhagias occurred during the two months when the treatment was interrupted (August and September), but in spite of that, the general condition of the patient was sensibly improved (better appearance, more strength, and could walk better).

Second period.—The treatment was recommenced October 13, 1892, + galvanism 140 ma., five minutes, which was well borne and without painful post-operative reaction. Then from the 20th of October to December 13, six alternating treatments. Finally, the hemorrhage and leucorrhœa having returned, galvanism was resumed. From December 15 to July 13, 1893, + galvanism was given twenty-nine times. Dose 145, 170, 100, 150, 140, 165, 80, 125, 150, 140, 150, 150, 140, 150, 135, 135, 145, 140, 145, 120, 130, 125, 125, 130, 130, 130, 110, 145, 60, 100 ma. Five minutes on an average.

As usual, I kept a complete record, and no evidence of either painful or febrile post-operative reaction was shown. Treatments were three times a week, or every other day.

This treatment helped the hemorrhage, though slowly; menses were regular or late, and less abundant, and in July, 1893, they were delayed thirteen days, which had never before occurred with her. The general health was fair, locomotion easier, sleep good, and the anterior pain seemed to have disappeared; nevertheless a slight flow, leucorrhœa, or hydrorrhea, persisted.

A phlebitis, which confined the patient to bed for six weeks, interrupted the treatment for three and one-half months.

The amelioration of the hemorrhage lasted two months after the last treatment (July and August), the menses being normal. But by October the menorrhagia was marked.

Third period.—Patient returned to the clinic in November, 1893. The tumor had not increased in size. The anatomical situation appeared to be the same, probably without phlegmasia of the adnexa.

Then ten treatments were given, from November, 2, 1893, to January 11, 1894. The doses being 100, 100, 110, 100, 110, 140, 85, 105, 110, 100 ma., for five minutes. No marked reaction. The hemorrhage continued and a new symptom appeared. A gray, watery discharge, mixed with pus, and having a foul odor.

As the menorrhagia relapsed so frequently, the intra-uterine treatment seemed ineffectual, and as the tumor was readily accessible, galvano-puncture was tried.

A new gold trocar, insulated to a few millimeters from the end, permits through its insulation, a large quantity, without much pain or scarring of the vagina, and avoids all danger of a subsequent septicæmia.

On January 30 and May 8, 1894, + galvano-punctures were made without anæsthesia, 100 and 140 ma. being given. Though they were well supported they did not seem to benefit the patient. Then uterine treatment was suspended for two months, and the improvement of the depressed general health was attempted by means of baths with rapidly alternating currents.

But the persistence of the hydrorrhea necessitated the resumption of the galvanism. Renal pain, extending to the sides of the abdomen, had returned. September 18, forty-seventh + galvanic treatment, 70 ma., five minutes, well supported. September 20, 22, 25, and 27, 100, 110, 180, 200 ma. were given respectively. All well supported.

All the operations had been well borne and without marked post-operative reaction, though the sound was always 7–8 cm. in the uterus, but there were no results. A last examination, on December 23, 1894, confirmed the fears I had had for a year.

The final failure of intra-uterine galvanism patiently given, and well borne, as well as the appearance of an abundant and fetid hydrorrhea, had made me suspect a malignant degeneration, which was slow to show itself externally.

But by the end of December a false diagnosis was impossible. I at once advised her to be operated upon, and on the 10th of January Dr. Le Bec performed an abdominal hysterectomy.

Report of the Operation.—I found a large fibroid growing from the fundus: a smaller one was found at the left.

Numerous adhesions bound the mesentary and even the intestine to the tumor. The adnexa were high, and pushed back. I made a total extirpation by the method I had adopted.

Results of the Operation.—January 11. Temperature 37.5°. Pulse, 80-92. Abdomen insensible. 12th. Same condition; slight movement. 15th. Sleep good, a little nourishment; tampon removed, and carbolic injection. 17th. Two abdominal sutures had formed a small abscess—the others in good condition. 19th. Unpleasantly smelling vaginal discharge. With the speculum it could be seen that part of the particles had reunited, and that a little pus was behind. This was remedied with a drain and a strong carbolic injection. General health good. 20th. Drain, which had fallen, replaced. 25th. Drain removed, and wire cut.

Examination of Tumor.—Adhesions, which show no signs of inflammation. The cancer limited to the cervix, extending to the internal os, but not above. The cervical canal dilated, and its walls degenerated. The uterine body enlarged by a fibroma, growing posteriorly, and interstitial tumors which show microscopically all the characters of the classical fibroid, without any signs of degeneration. *The adnexa normal, without signs of recent or old inflammatory processes.*

Conclusions.—The bimanual examination showed a woman without inflammation of the adnexa. The only manifest lesion was a fibroid, apparently simple. But we know that laparotomies frequently reveal the inadequacy of bimanual examination. Therefore I have sought in the electrical application a more certain method of diagnosis, and I think it has the precedence of the bimanual examination. Here the two methods agreed in stating that there was no inflammation of the adnexa. This was substantiated by the laparotomy, and shows the importance I give to value of the testimony of galvanism, applied patiently, methodically, and wisely. But, in the last year, the galvanism acquired a further interest, from the degeneration of the cervix, with the conservation of the integrity of the uterine body. The progressive cachexia caused by the malignant degeneration could,

a priori, be expected to stop the treatment. Actually it did not do so, and this case shows us what we already know, that the condition of the adnexa partly regulates the galvanic tolerance, and further, that this tolerance is not directly influenced by the localized degeneration of the cervix, though the contrary is true in the degeneration of the entire body, as I demonstrated to you last October.

TREATMENT OF GOUT AND RHEUMATISM BY MEANS OF THE ELECTROLYTIC INTRO- DUCTION OF LITHIUM.

BY DRS. LABATUT, JOURDANET, AND PORTE.

Since the remarkable researches of Davy upon electrolytic decomposition of substances held in solution, medical science has ever been engaged in trying to utilize this principle in the treatment of disease. It has attempted to do this more especially in the introduction of medicinal substances into the tissues. Rabbits have been killed by passing an electric current through them, the positive pole being saturated with a solution of strychnine. Anæsthesia has also been produced by the introduction of cocaine in this manner.

Attempts have been made to make use of this principle in the treatment of all forms of gout and rheumatism.

Numerous attempts have been made in this direction, but their value has been somewhat impaired by their lack of scientific accuracy and also by the fact that the action of the electric current alone is of great value in the treatment of these affections.

In certain experiments made by one of us it has been definitely settled that lithium can be introduced into the body through the skin; that the penetration and saturation of any given region is only a question of time; and that the quantity absorbed cannot possibly be attributed to the action of dialysis.

In the case of the electrolysis of lithium, in spite of the small quantity introduced, the effect produced is greater than when the same remedy is taken by the stomach.

Let us suppose that fifty centigrams of carbonate of lithium are given to a patient by the mouth, and that the whole dose is absorbed (a fact which is not at all probable). In this case five centigrams of lithium are introduced into the torrent of the circulation in a condition most favorable for elimination by the kidneys before any very decided action upon the tissues has taken place. When it is introduced directly into the tissues by means of electrolysis, it has its full action upon them before it gets into the blood. It has the best possible chance, therefore, to dissolve the uric acid which it finds in the tissues before its own elimination.

Suppose the hand is exposed for an hour to the action of a current of twenty ma., there would be introduced into the tissues five milligrams of lithium, one-tenth of the dose taken by the mouth. As this quantity acts upon a weight of tissue only one-hundredth part of the weight of the whole body, the actual amount brought in contact with the tissues is ten times as great.

The solution of chloride of lithium is placed in contact with the skin in the form of a bath.

We use a solution of two per cent. rendered alkaline by the addition of a little caustic lithium.

The current is allowed to escape from the body by means of a bath of chloride of sodium.

The lithium should be introduced over the whole area of parts affected, and not simply at the painful points.

The solution of chloride of lithium into which the affected part is immersed is connected with the positive pole by means of a carbon electrode plunged into it. The negative pole is connected in the same manner with the bath of chloride of sodium.

The vessels for holding the solutions differ according to

the parts to be treated. For the hands and feet the ordinary glass jars of commerce serve very well.

For treating the knee a ring of wood is used encircling the joint. Its upper and lower openings are closed by rubber cloth pierced with a hole for the passage of the leg.

A similar apparatus is used for the elbow.

For the shoulders and the loins the problem of arranging the apparatus is a more difficult one, and the operator must depend upon his own ingenuity.

The strength of the current should not exceed 20 ma. for each square decimeter of surface. Ten ma. is the dose we ordinarily employ. The average length of treatment is half an hour, but there is no harm in prolonging it to an hour and in giving two a day if necessary. The affections specially suitable for the application of this form of treatment are the articular forms of gout and acute rheumatism, and certain forms of chronic rheumatism.

In chronic rheumatism it cannot be claimed to remove the lesions of the bones and cartilages, but, on the other hand, it will cause pretty rapid disappearance of the pain and swelling which result from these lesions.

We have obtained specially good results in chronic rheumatism of the hand, in those cases where articular deformation had not yet occurred.

It is interesting to note that the improvement often continued long after the cessation of the treatment, and it was only after the lapse of two or three months that the results of the treatment could be fairly appreciated.

In acute articular rheumatism it seemed to us that the electrolytic treatment stopped the pain and swelling quicker than remedies such as the salicylate of soda. The functional weakness seemed to yield with special rapidity.

In these cases there are often vasomotor troubles accompanying the other symptom, and in passing the hand over the part there will be felt a peculiar sensation of coldness. Furthermore, a peculiar amber color of the parts may often be observed.

As the treatment progresses the normal temperature and color gradually return.

When the cases are obstinate and require a larger number of treatments there are certain little incidents which may occur. Sometimes when the current first begins to flow there is a painful sensation of tingling, which passes away at the end of five minutes.

If the skin is broken at any point where the current is to be applied it is necessary to protect these spots with vaseline. If this is not done they may become so sensitive as to require interruption of the treatment for a few days.

While the treatment is being carried on some attention must be paid to the muscles surrounding the affected joints. These muscles are almost sure to deteriorate on account of the long period of immobility to which they are condemned.

They should therefore receive frequent stimulation by means of the faradic current, so that when the joint itself is restored its movements may be perfect.

The faradic reaction of the muscles is also an important sign in prognosis. The better they react the more chance there is of complete restoration.

Massage is also of value in restoring to the muscles their lost vigor.

CASE I.—Gouty deposit; merchant, æt. forty-three. A stout, robust man of a plethoric temperament, and with an old gouty diathesis. The right hand and foot were the seats of numerous calcarious deposits. The hand was so badly affected that he could not close it, nor could he make any use of it even for eating.

A current of 35 ma. was passed through the hand for an hour, after which a decided improvement in the movements was noticed.

Two other treatments were given at an interval of two days, each lasting half an hour. Six days later there were left only traces of the deposit, and the patient was able to attend to his correspondence.

CASE II.—M. A., æt. fifty; family history of rheumatism. Had an attack of gout in the left great toe, with painful swelling and tension of the skin. Could not bear the weight upon the foot. Current of 25 ma., two treatments a day. Marked improvement after the fourth treatment. Seven treatments were given in all. The swelling and redness entirely disappeared; there remained only a slight pain on pressure.

CASE III.—M. E., student, æt. twenty-five, large and strong, subject to rheumatism since he was nine years old. Attacks came every two years and would last about a month.

On the eve of an attack had a pain in the right wrist as if it was to be the seat of inflammation.

The wrist was treated with a current of 16 ma. for twenty-five minutes. The attack came on the next day, but the wrist which had been treated was spared. After the acute attack was over the chronic condition was treated joint by joint. It was found that seven hours after each treatment the joint treated would be entirely relieved, while the other articulations would remain just as they were.

To sum up it may be said that the introduction of substances into the organism by the action of the constant current is proven beyond question.

The results obtained in the treatment of gout and rheumatism by means of the constant current are due largely to its electrolytic action. The quantity of the medicament introduced by means of the current, although very small, produces a greater effect than when taken by the stomach, on account of the fact that it is brought directly in contact with the diseased tissues.

Faradism and massage are also important adjuncts to the treatment.

EPITOMES.

ELECTRICITY IN OBSTRUCTION OF THE BOWELS.

Dr. Althaus, in the *British Medical Journal*, cites a case of a man, fifty-four years old, who had suffered from obstinate constipation for three months. Bowels had not moved for ten days, and the abdomen was distended and tender; appetite lost, condition of collapse, face sunken and small, feeble pulse. An insulated sound (free metallic end) was introduced into the rectum and a moistened pad over region of sigmoid flexure. The force of a primary current was gradually increased until a decided vibration was felt in the bowels. A copious evacuation resulted in twenty-four hours with a marked relief to all the symptoms. The bowels acted ten times during the next two days, and the patient in the course of a week was pronounced well.

A woman, æt. fifty-seven, was similarly affected, and a like result was attained from the same treatment.

THE IMPROVED FARADIC APPARATUS OF ENGLEMAN.

Messrs. Waite & Bartlett are the manufacturers of Dr. Englemann's perfected faradic apparatus, of which R. M. Slaughter, M. D., says, in the *Virginia Medical Monthly*, that this battery has one motive power to furnish an independent force for the propulsion of the interrupter, and another to furnish the current for the induction coil. By this arrangement the most delicate or the most powerful inducing current can be used with any desired rate of interruption, whether one or one hundred thousand per minute. The interrupter is characterized by controllability and rapidity. The physiological and therapeutic efficiency of the current is extended, as greater rapidity of interruption is admitted than hitherto, and there is perfect control over the interruptions. The series of secondary coils vary in the number of the winds and in the thickness of the wire used, are each of known physical and therapeutic power, and adapted to its special therapeutic purpose for effect on muscle and nerve.

ELECTROLYSIS IN DETACHMENT OF THE RETINA.

Terson (*Presse Med., Times and Register*), in a paper before the Société Française d'Ophtalmologie, gave a summary of twelve cases of retinal detachment he had treated by electrolysis. Fine platinum-iridium electrodes were used, and the anode was introduced through the sclerotic opening, as small as possible, at the seat of the detachment. Five or six milliamperes are not to be exceeded, and the *séance* should not last longer than one minute. The following were the results attained: "One, an old case of three years standing, was made worse; two were unaffected, five were temporarily improved, five were considerably improved, and one case was cured"; a myopic woman of thirty-eight, who had for eight days a detachment of more than a fourth of the lower part of the retina and almost total blindness; the vitreous was turbid; forty-eight hours after the first application the retina was found completely replaced and the vitreous humor cleared. There was no relapse nine months later.

METALLIC ELECTROLYSIS.

BY C. S. NEISWANGER, M. D.

Dr. Neiswanger, in the *Alkaloidal Clinic*, recommends, in old cases of gleet or in granular conditions of the prostate, after excluding stricture, the selection of a copper sound which can be easily passed to the full depth of the urethra and then attached to the anode—the cathode should be placed upon some indifferent point. The current is gradually turned on until fifteen milliamperes are passing, and this should be maintained for five minutes, when, as the electrode is now fast to the mucous lining of the canal, the current is gradually turned off, the pole changer turned over, and the current again turned on until the meter indicates seven or eight milliamperes, when, after a few minutes, the electrode becomes loose, the current is again turned off, and the electrode removed.

The electrodes are made of ninety-seven per cent. pure copper and are ten inches long. The intra-uterine electrode is insulated so as to protect the vaginal walls and the external os.

The prostatic urethral electrode has an active surface of two

and four square centimeters, is properly insulated, and the distal end has an olive of hard rubber.

Copper wire can be easily made into needles for cystic growths.

Excessive cauterization is sometimes caused in ordinary applications to mucous surfaces, and it often leaves a hard, unyielding cicatrix, as if burned by acid, if the anode has been applied, or, where the cathode has been used, a soft, pliable one will be noticed; but the anode, if made of copper, zinc, or iron, will cause the current to expand upon the metal and there will be no cauterization of the tissues.

Several cases of psoriatic lesion and two extensive patches of lupus are reported to have entirely disappeared under this treatment.

Light currents are used and the pain is slight. If desirable, cocaine anæsthesia is easily accomplished. Cystic growths are amenable to this treatment. On account of its escharotic properties, zinc is almost wholly limited to the stump after excision of malignant growths or recurrent cancer. If iron is used, it gives the tonic and styptic effects of iron directly applied.

ECTOPIC PREGNANCY.

Dr. Goelet, in the Kings County Medical Association, said: "No deaths have occurred which could be attributed to the uses of electricity in ectopic gestation, and no evil results have followed. On the contrary the health of the patient has been good for periods varying from one to eight years afterward."

—Dr. S. H. Monell, in the *Times and Register*, commenting upon the subject of electricity as a therapeutic agent, says: "The rate of current flow of accurate knowledge respecting medical electricity and its scientific application to afflicted patients may be justly compared to the calm progression of cold sorghum from the bunghole of a barrel in winter time. It flows, but it flows slowly—very slowly indeed."

The doctor also says: "So far a few pioneer physicians who have first taught themselves something of electro-therapeutics have done most of the work of propagandism. Teaching will properly always be chiefly done by these and others like them in post-graduate schools, clinics, and specially provided courses of

instruction. But the real missionary work, the spread of general information on the value of this agent, the building up of a belief in its value among general practitioners, the uprooting of old prejudices, the out-casting of the pernicious family battery, the substitution of high grade apparatus, the development of a recognition of the differences in form, effect, dose, methods of production, and wide range of differences in application ; and, furthermore, that approved curative results require the proper selection of current, dose, and technique, devolve of necessity upon the manufacturer. He alone has a financial stake in the growth of a market for his wares. He alone can employ the resources of advertising, without which the demand for good batteries will be as slow to spread as the demand for overcoats in Africa."

ELECTRICITY IN THE TREATMENT OF EXOPHTHALMIC GOITER.

The *Times and Register* publishes a synopsis of Dr. Robert Newman's paper, read before the American Medical Association in Baltimore, and gives a few cases to show his treatment of goiter. The first case was an aggravated one and had been for ten years under the care of an eminent electro-therapeutist, with some improvement from a condition in which her life had been despaired of. Dr. Newman treated her one year and discharged her cured. Three or four treatments with galvanism were given a week. Medical electrolysis promoted the absorption of the tissues, causing protrusion of the eyes. A saline solution was put in an eye cup and applied by means of the anode to the eye and a mild current used. The cathode (a sponge pad) was applied to the thyroid. Applications to the sympathetic were varied in manner and the solar plexus was especially influenced.

The second case was a less aggravated one and marked improvement was shown from nine months' treatment by galvanism.

The third was an opera singer whose mother had died of Graves' disease, and medical treatment had done her no good, and she had finally been obliged to resign her profession. In less than four months' galvanic treatment with Dr. Newman all symptoms disappeared, and she was ready to resume her profession.

Excellent effect was attained by the addition of the static spray twice a week.

The indications for treatment were: "To reduce the pulse, regulate the heart's action, produce rest and sleep, and allay nervous irritation; to diminish the size of the thyroid gland; to remove the plastic new formation behind the eyeballs, as otherwise the protrusion of the eyes and consequent deformity of expression cannot be relieved."

ELECTRICAL TERMS.

The "volt" is the unit of measure of electro-motive force which will circulate a current of electricity of one "ampere" through a resistance of one "ohm."

The "ampere" is the unit of measure of the volume of the "volt" or "strength" of a current. The "ohm" is the unit of measure of the resistance of the circuit.

The number of amperes flowing through any circuit is equal to the number of volts of electro-motive force, divided by the number of ohms of resistance in the entire circuit. (Ohm's law.)

The term "electro-motive force" is used to designate the pressure or head under and by virtue of which an electric current circulates. This is created by a "difference of potential" causes, from the two sides of the source of supply.

"Difference of potential" corresponds to a difference in level in hydraulics or a difference in temperature in thermo-dynamics. A current will flow from a higher or "positive" potential to a lower or "negative" potential, as there exists a difference of potential.

The "coulomb" is the established unit of measurement of the quantity of the current, and its value is equal to that quantity of electricity which will flow through or into a body when one ampere of strength flows for one second of time.—*Exchange*.

ELECTRICITY AS A MEANS OF DIAGNOSIS IN GYNECOLOGY.

The Charlotte *Medical Journal* says that Houdarf believes that, as electricity has been found of benefit in the diagnosis of ner-

vous diseases, it will be of benefit in the differential diagnosis of the diseases of the female genital organs. Where the uterine adnexa are healthy, a continuous current of from 100 to 200 ma. can be applied without symptoms; when inflammatory disease is present there is intolerance to this current, and pain or fever always follows. The fever always indicates the presence of pus. Nausea, vomiting, headache, syncope, nervousness, and diarrhea are of secondary value in diagnoses, and indicate either hysteria or adnexa disease. Positive results can be attained by the faradic current wherein tolerance is dependent upon nervousness. From thirty cases, his conclusions are that the diagnosis of pelvic inflammatory disease is made much easier by means of the galvanic or faradic current, but it is not infallible; that it is not possible to discover inflammatory disease surrounding the uterus, but ovarine and uterine pain of nervous origin can be isolated; that no symptoms, or a reaction-pain, or fever follows a medium-intensity current (56 ma.). Where there is intolerance, an operation is indicated positively; but the operation is not indicated where there is tolerance; that, with antiseptic precautions, electrical examinations are without danger. The contra-indications are acute peritonitis and pregnancy.

INCONTINENCE OF URINE.

This condition can sometimes be relieved by the local application of the faradic current, by means of a bipolar urethral electrode with the active points corresponding to the two sphincters, or a simple urethral bulbous electrode can be used as the active electrode, and a large pad or sponge electrode should be placed over the bladder. The coarse wire secondary coil, if the muscular tone needs improvement, should be used for five minutes daily.—*Medical Brief.*

DERMO-NEUROSES AND THEIR TREATMENT.

H. Leloir (*Times and Register*) has employed the induced current in about twenty-five cases of localized or general pruritus, the more tenacious of which had resisted all treatment, with the most unexpected results. After a variable number of applications, a good number of cases of the extremities, vulva, and anus, were cured—the eczematous or lichenoid condition, secondary to

the pruritus, disappeared. The pruritus was relieved considerably in some cases, but did not entirely disappear, and it resisted all treatment in others. The patient is connected with one pole of a powerful static machine and insulated, and a metallic point connected with the other pole is then held at about 0.10 to 0.15 cent. from the affected area and passed slowly over the affected parts in from twelve to fifteen minutes.

ELECTRICAL MISCELLANY.

—The galvanic current will promptly relieve neuralgia of the urethra. The cathode should be placed in the vagina and a sponge or felt electrode (anode) over the bladder, and a current of from 10 to 15 ma. passed for a few minutes, or until relieved.—*Brief.*

—I. S. Haynes, M. D., in the *New York Medical Journal*, says of electricity in tubal pregnancy: "Passing a current of electricity through the sac, while inducing absorption, is attended with much danger, and should not be depended upon."

—Dr. Sinkler, in the *Medical News*, reports three cases of numbness of the extremities where ergot relieved the symptoms quickly, and says that massage, general faradization, change of air, tonics, and anti-lithemic remedies are of value to improve the nutrition.

—A quilted cushion, with fine wires inside, through which the desired degree of heat may be maintained by electricity, and called the *thermogen*, was exhibited at the last meeting of the Royal Society of England. The thermogen does away with blankets and hot-water bottles in the operating room and will keep up the temperature of the patient.—*Pacific Medical Record.*

—L. Wolff, in *Göteborg's Lakäresällskaps Förhandlingar*, recommends nitrate of silver, gr. $\frac{1}{6}$; extract belladonna, gr. $\frac{1}{8}$, given, during the free intervals, an hour before meals, where the so-called gastric crisis is the first and dominating symptoms of tabes dorsalis. Galvanism to the spine, neck, and abdomen, five minutes every day or so for several weeks, with a tepid bath at a temperature below 20° to 22° C., is also recommended.

—Dr. Gowers says that electricity is very beneficial in athetosis.

—The tendon reflex is absent in ninety-eight per cent. of the cases of locomotor ataxia. *Gross Medical College Bulletin* says apply the anode over the cervical region and the cathode over the dorsal region.

—The *Gross Medical College Bulletin*, in neurasthenia or hypochondriasis, recommends cups to the spine, counter irritants, rest, restoratives, general faradization—one electrode on the soles of the feet and the other on the cervical region.

—In central galvanization, the *Gross Medical College Bulletin* advises the placing of one pole on the nape of the neck and the other on the epigastrium. Place the anode at a distance from the affected region usually.

—Until the acute symptoms of pain have disappeared, says the *Gross Medical College Bulletin*, electricity should not be applied. One electrode should be placed on the nape of the neck, and the other on the affected muscles, for from eight to ten minutes.

—In diphtheritic paralysis, the faradic current should be applied to the affected part, according to the *Gross Medical College Bulletin*. One electrode should be placed upon either side of the larynx, if deglutition is interfered with.

—Place one pole over the epigastric region, and the other between the scapulæ, in asphyxia of the new-born infant, *vide* the *Gross Medical College Bulletin*. (Don't say what current to use, but I suppose the faradic.—B.) If the electrode is applied to the side of the neck it is liable to arrest the heart's action through contact with the pneumogastric.

—To relax the spasms on the side to which the head is drawn in torticollis, use the galvanic current. To strengthen the relaxed muscles on the relaxed side, apply the faradic current.—*Gross Medical College Bulletin*.

—The galvanic and faradic currents may be applied alternately in asthma, recommends the *Gross Medical College Bulletin*.

—As rheumatism is primarily due to bad nutrition, and as high frequently alternating currents act as stimulants to nutrition,

electricity would seem to be indicated, provided it is intelligently applied.—*Times and Register*.

—By means of the continuous current, Silva Arango of Rio Janeiro has attained remarkable and encouraging results in the treatment of elephantiasis.—*Times and Register*.

—Dr. H. F. Biggar, of Cleveland, O., says that the most popular palliative in ectopic gestation is electrolysis. He also says that "galvanism, as a method, should be condemned" in the treatment of ectopic gestation.—*North American Journal of Homeopathy*.

—If in neuralgia the pain is superficial, but is increased by pressure, the galvanic current should be used; but should the pain be deep, or for lumbago, without tenderness, use the faradic current.

—Use a mild galvanic current in facial paralysis and stroke the sponge electrode over the course of the nerves.

—The galvanic current from two cells should be used for one minute in head affections and migraine. Place one electrode on the nape of the neck and the other on the brow, with five interruptions, for brow ache.

—The nutrition of the parts is changed by the continuous current, while from the application of the faradic the motor and sensory nerves are mechanically affected, stimulating the muscles to contraction. The galvanic current is indicated, if paralyzed muscles respond to the faradic.

—Dr. T. D. Crothers, editor of *The Quarterly Journal of Inebriety*, published under the auspices of The American Association for the Study and Cure of Inebriates, and who is an authority on neurosis, writes in his last number as follows: Antikamnia and quinine are put up in tablet form, each tablet containing $2\frac{1}{2}$ grains of antikamnia and $2\frac{1}{2}$ grains of quinine, and is the most satisfactory mode of exhibition. This combination is especially valuable in headache (hemicrania), and the neuralgias occurring in anæmic patients who have malarial cachexia, and in a large number of affections more or less dependent upon this cachectic condition.

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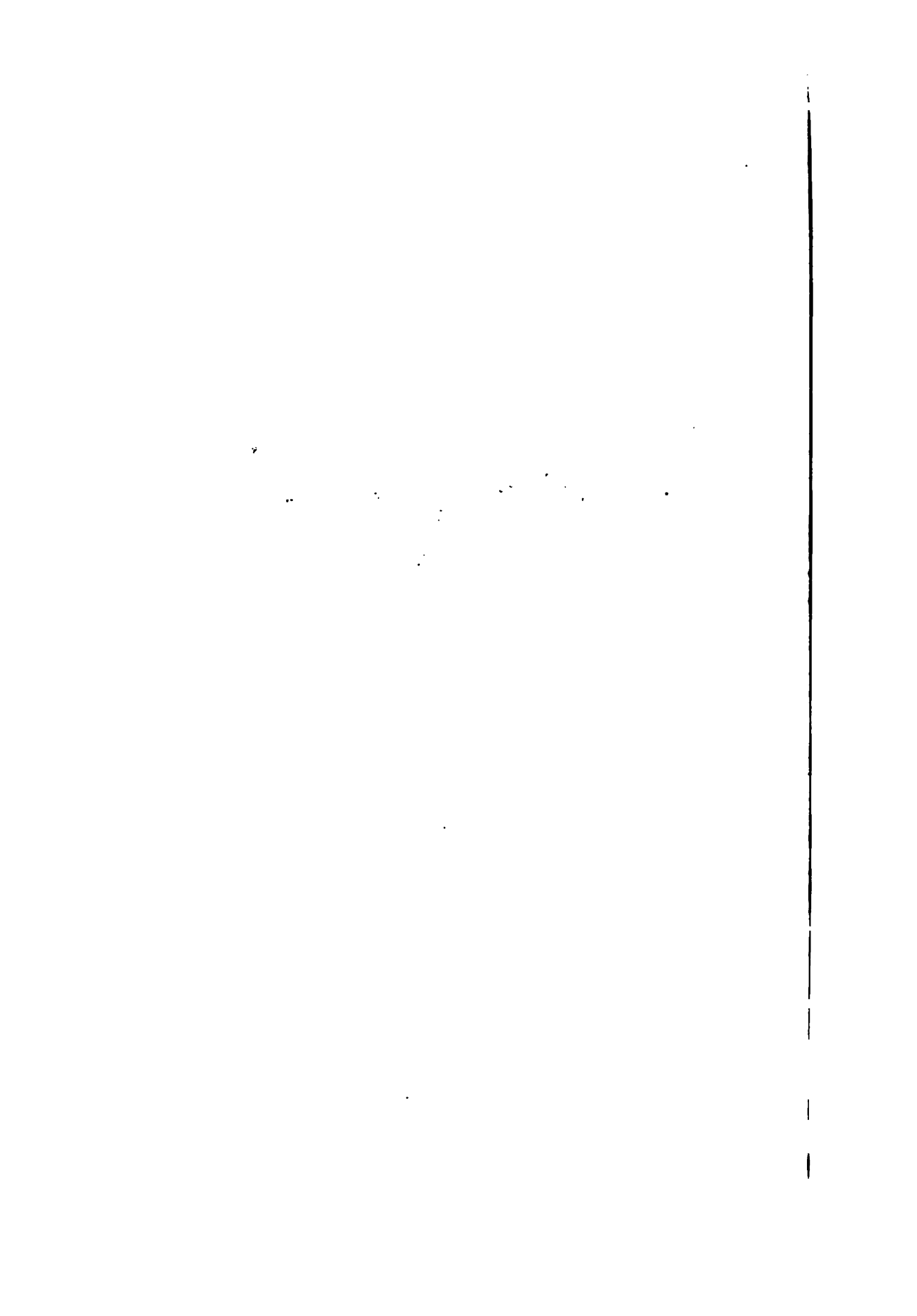
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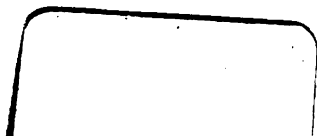
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